ELECTRICAL REVIEW

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VIEWS, NEWS AND INTERVIEWS.

"The importance of electrical appliances," said a well known engineer, "as a means of offense and defense is generally conceded, although their possibilities are not realized to-day as I believe they will be, by the whole world, before this war is over. Electrical inventors and others should, however, be careful not to waste the time of the government authorities by bringing before them apparatus and plans unless there is a reasonable assurance of their success. There have been exploited numerous schemes, impossible of practical application. In times like these, it is wrong to overburden the Navy and War departments with the consideration of useless contraptions."

Two well known engineers of the General Electric Company have invented torpedoes which it is understood, possess novel features of merit. Mr. Caryl D. Haskins is the inventor of an automobile torpedo, and Dr. Louis Bell has invented a dirigible torpedo.

When Mrs. McKinley visited New York city recently, her apartments at the hotel where she stopped were equipped with a long-distance telephone, giving her direct connection with the President's office in the White House at Washington. Mrs. McKinley was thus enabled to enjoy a few days' rest, and, at the same time, keep in hearing of the President's voice and of the official news of the hour.

The United States Government has seized the cable office at Key West. The Western Union Telegraph Company has been obliged to vacate the office, and Captain Thompson, of the United States Army, has taken charge. Cable messages are being transmitted as usual between Havana and the United States, via Key West, but subject to United States censorship at Key West.

Among recent export orders for American electrical apparatus was one for $15,000 to go to Algoa Bay, South Africa. Another was for 40 miles of wire for an electric lighting plant in the Argentine Republic. Nearly all the electrical apparatus now used in Argentina is of American manufacture.

W. R. Blackman has been sentenced to 10 years in San Quentin Prison for embezzling $3,333 from the Los Angeles, Cal., Electric Company.

On September 1, 1891, there were only three German cities having electric street railways. On September 1, 1897, 56 cities were already in possession of such roads, while 34 other cities had roads under construction or were taking steps to build them. At the latter date there were 585 miles—or counting double tracks twice, 827 miles—of lines in operation. There were 2,255 motor cars and 1,601 other cars in use.

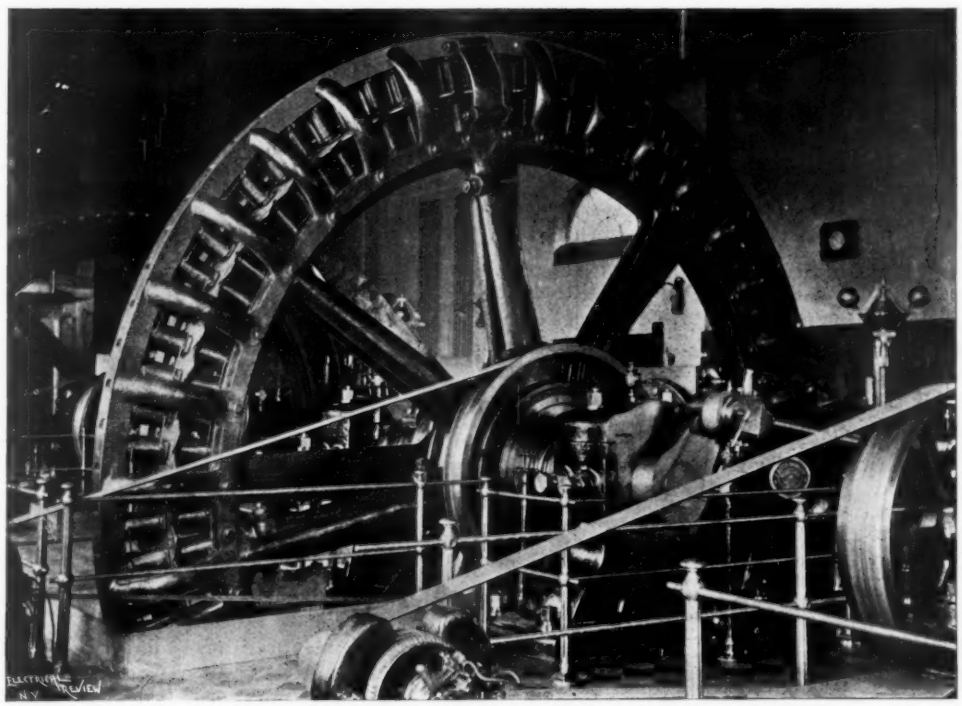
The biggest scheme for utilizing water-power electrically in Mexico yet proposed has now come to a head. A contract for machinery and appliances, costing nearly $1,000,000, has been let to American manufacturers. Three falls of the Monte Alto and three on the Tlatnepantla River, yielding about 6,000 horse-power altogether, are to be turned to account. Twenty water wheels, each running a 300 horse-power dynamo, will be required.

Every car on the Paterson, N. J., Street Railway Line that left the shed last Wednesday was decorated with American flags at each end. Several patriotic motormen and conductors had already arrayed their cars with the national emblem, and then the company took the matter in hand. Vice-President Hobart is president of this company, which operates more than 50 miles of track in the county.

PATIN'S NEW FLYWHEEL DYNAMO.

BY L. BAYLY.

The origin of this article was a visit paid to the large and admirably organized central station recently established at Puteaux, France, by Messrs. Patin & Company. It is, perhaps, not generally known that Patin & Company were the first to establish central stations in France on the alternating system. The latest form of dynamo adopted, almost exclusively in their installations, is shown in the accompanying engraving. The armature is fixed, and the magnets, forming, as they do, the flywheel of the engine, revolve round it. As for the engines, they are of the slow-rotating Corliss type and need no eulogy here. The advantages in doing away, if possible, with most of the high-speed motors in vogue in our electric light installations can, perhaps, be best appreciated by a practical steam-engine constructor, but most of our electrical experts have been for years sensible to their defects. The efficiency of Corliss engines, such as the one in the engraving, amounts, per calculation, to some 87 per cent—a figure necessarily higher than any obtained from high-speed engines. It is the Corliss engine, therefore, that M. Patin has made the basis of his operations.



PATIN'S NEW FLYWHEEL DYNAMO IN THE CENTRAL STATION AT PUTEAUX, FRANCE.

Passing over a detailed description of the motor, with its ingenious device for regulating the admission of steam from 0—75 per cent, we betake ourselves at once to an examination of the flywheel—forming, as it does, an integral part of the dynamo itself.

The flywheel is composed of two distinct portions: (1) An inner ring of cast-iron bolted together in sections and bound to the axle by spokes of

the same material. The periphery of the ring exhibits a number of poles constructed in soft iron and forming the magnetic field. Each of these poles bears a rectangular excrescence, also of soft iron, which is removable for the purposes of winding, etc. The actual number of poles in use on these machines is a variable one, depending on the size of the dynamo and the speed of rotation required. (2) An outer ring of cast-iron, also bearing a number of poles equal and diametrically opposite to those of the inner ring. The two rings move simultaneously and in the same direction, being bound together by the radial arms and a massive ring of cast-iron solidly bolted to the inner ring. The whole is put together so as to leave, between the inner and outer poles, a space of some two inches, in which space, as will presently be seen, the bobbins of the armature revolve.

The armature is of more singular construction. A light ring of cast-iron, borne on spokes after the manner of the magnetic poles, supports a crown of flat coils composed of alternate ribbons of copper and asbestos (fibrine). Each coil is independent of its neighbor, and can be replaced at a moment's notice if necessary. Copper bands connect the coils in series or in arc, and the whole is covered and protected by a thick coating of lacquer. As will be seen, the ring of coils is constructed to fit between the opposing poles of the magnets, i. e., in the magnetic field, with a play of some millimetres only.

Here we come to one of the many advantages presented by the Patin dynamo; viz., the doing away with brushes or collectors of any kind, and the consequent avoidance of expense in the direction of wear and tear, etc. Two copper conductors receive the accumulated current in the upper part of the armature, whence it is taken quietly and invisibly to the transformers. The weight of the magnet is borne by a strong pillar of cast-iron, through the center of which passes the axle of the engine. The whole thing practically forms a uniform mass with the engine, and the saving in space adduced by this arrangement is by no means a thing to be overlooked. A series of nuts working in grooves prevent any circular movement on the part of the armature, and a second series determine the exact position of the armature coils with regard to the magnetic field.

In case of an accident happening to one or more of the coils, the whole mass of the armature can, by a very simple device, be slid bodily out of the magnetic field, along the axle of the engine. Once free, the armature can be disconnected from the leads and its ring of coils visited one by one.

The excitement of the electromagnets can be accomplished either by a supplementary dynamo or by utilizing a part of the current generated in the form of a "shunt." The devices here suggested hardly differ from those usually employed in lighting stations, and universally familiar to all practical electricians.

M. Patin's dynamos are constructed to supply from 50 to 600 horse-power of energy. For the smaller varieties, the speed would, of course, be greater, and the facility which this type of dynamo offers in its adaptability to turbines, high-speed motor, etc., is self-evident.

Perhaps it will be as well now to give some figures based on actual results obtained with dynamos of this type. The two machines quoted are at present working in two separate stations, the one being coupled to a Faesch & Piccard turbine, the other to a Corliss engine of the kind pictured in the illustration. Here are some data:

	No. 1.	No. 2.
Power in watts	40,000	120,000
Volts	2,400	2,400
Resistance of armature	4.5 ohms	.96 ohms
No. of coils on magnet	24	104
No. of coils on armature	24	104
No. of revolutions	300	95
Efficiency	94%	96%

The current spent in exciting the magnets has, of course, been taken into account in the general calculation of efficiency

Stockholders of the American Bell Telephone Company.

The following list of stockholders of the American Bell Telephone Company includes holders of 500 shares and over. These were the holdings on March 31, and are compared with two previous years:

	No. of Shares—		
Holders.	1898	1897	1896
Agassiz, Alex	573	521	475
Akin, Albert J	1,250	1,000	525
Ayer, Fred	878	798	725
Barbour, Ed. D	532	532	532
Bell, Mabel G	1,664	1,664	1,664
Bigelow, John	600	540	532
Blake Bros. & Co	2,138	1,947	2,214
Blake, Anna S. C	729	729	729
Blake, Arthur West	1,465	1,465	1,870
Blake, Francis	700	700	824
Blake, Francis, tr	743	743	747
Bowditch, Ern. W	647	904	800
Bowditch, Charles P., tr.	385	485	593
Bowditch, James H	1,050	1,050	1,000
Brooks, Henry J	500	500	295
Cabot, Susan B	810	737	670
Converse, E. S	582	212	100
Curtis & Motley	767	52	175
Childs, Wm. A	629	572	572
Cochrane, Alex. & Co	1,200	1,125	1,500
Coolidge, T. Jefferson	642	402	202
Cotton, Wm. C	1,050	946	860
Crane, W. Murray	4,122	3,520	3,200
Crane, Zenas	3,420	3,100	2,800
Crane, Fred G	660	600	518
Fay, Jos. S., Jr	1,058	1,000	1,100
Flagg, Augustus	550	550	500
Forbes, J. Malcolm	1,038	1,732	1,721
Forbes, Wm H. (est)	1,312	1,940	3,329
Foss, E. N	600	600	600
Graham, John M	650	50	...
Gray, Horace	725	725	639
Grew, Edw. S	1,000	1,000	1,000
Grew, Henry S	670	670	600
Grew, Jane N	880	880	800
Hall, Edw. J	...	605	595
Hubbard, Gardiner G., (est)	690	690	887
International Trust Co	650	100	...
Jackson & Curtis	1,299	1,850	2,209
Jacques, Kate S	550	500	500
Leland, Towle & Co	936	407	810
Lowell, Augustus	1,540	1,400	1,290
Lowell, Percival	1,696	1,596	1,450
Lyman, Arthur T., tr	990	900	900
Minot, Wm	797	541	267
Minot, Wm. Jr., tr	732	730	672
Morgan, J. P. & Co	1,725	2,996	2,675
Norman, Geo. H	600	500	500
Parker, Moses G	774	700	610
Peabody, Geo. A., tr	840	840	840
Pickman, Dudley L., per. & tr	950	950	1,000
Pollok, Anthony	769	699	636
Prescott, Eliza C	935	825	724
Plummer, Geo. A	500	100	5
Scull, Gideon	717	717	717
Sewall, Richard B	562	562	562
Sewall, William B	734	734	734
Spaulding, M. D. & J. P.	550	500	500
Stanley, Frank F., tr	1,807	1,642	1,642
Thomas, Wash. B	550	550	500
Tower, Giddings & Co.	1,112	560	205
Tuckerman, L. S., tr	504	504	502
Vail, Theo. N	4,784	4,804	....
Watson, Thos. A	1,610	1,610	1,610
Wells, Chas. B	424	559	558
White, W. A. & A. M.	780	545	300
Williams, Chas., Jr	550	550	550
Wilkins, Walter P	550	..	..
Wright, Esther F	1,410	1,200	1,036
Wright, Mary E	875	710	566

The Boston *News Bureau* says that there are now 6,882 different stockholders as against about 6,600 last year.

Mr. Theo. N. Vail appears as the largest stockholder, 4,784 shares, with Hon. W. Murray Crane the second largest stockholder, with 4,122 shares. The holdings of J. P. Morgan & Company have been reduced 1,271 shares during the year. The 13 directors this year hold 4,394 shares of stock compared with 5,651 shares in 1897 and 7,770 shares in 1896.

League of American Municipalities.

The second annual convention of the League of American Municipalities will be held at Detroit the first four days of August. Mayors, councilmen and aldermen throughout the country are already manifesting a lively interest in the forthcoming meeting. Among the topics suggested for the programme are:

"Remuneration of Cities for Franchise Rights In, Over and Under Public Streets and Alleys. What Remuneration, If Any, Should Be Exacted from Light, Water, Street Railway, Telephone and Subway Corporations, and How Should It Be Collected?"

"Electric Lines Overhead and Underground. What Means Should a Municipality Use to Protect Life and Property from the Improper Construction of Electric Lights for Telephone, Telegraph, Lighting and Street Railway Purposes?"

Mr. B. F. Gilkison, of New York city, is the secretary of the League of American Municipalities.

Mr. Myron A. Knapp, of Chicago, visited New York last week and renewed many acquaintances.

GENERAL ELECTRIC COMPANY'S ANNUAL REPORT.

A SUMMARY OF THE COMPANY'S BUSINESS IN 1897.

The annual meeting of stockholders of the General Electric Company will be held at Schenectady, N. Y., on May 10, at noon, to elect a board of 13 directors. The sixth annual report of the company, as of January 31, 1898, will be presented at that time. The report is published in abstract below:

PRESIDENT'S REPORT.

SCHENECTADY, N. Y., April 25, 1898.

TO THE STOCKHOLDERS OF THE GENERAL ELECTRIC COMPANY:

The past year witnessed a revival in business which increased rapidly in activity and volume during its latter months.

In the last annual report attention was called to the fact that your company began the year with less orders on hand than previous seasons. As a result of this, the actual output of your works has been slightly smaller than in previous years, although the orders received during the period have shown a marked increase. This increase will be reflected in the shipments of the ensuing year.

A careful scrutiny of the assets of your company, other than its patents, leads to the belief that previous values were conservatively fixed, and no changes of any significance have been necessary.

The patent account of the company has been kept at substantially the same amount on its books since the organization of the company. The question of a revaluation of patents is one to which consideration should be given at the proper time.

The growth of your business has made it necessary to make further expenditures for additions and changes at your factories and in acquiring much additional machinery.

Plans have been prepared and contracts partially closed for a new foundry and a large and important machine shop, the largest buildings yet erected by your company.

In anticipation of the investment in the construction and equipment of these new shops, which it is estimated will cost about $500,000, the sum of $250,000 has been deducted from the profits of the past year and carried to factory reserve account.

It has been the practice of the company to write off the amounts expended for additional factory facilities. It is thought that these allowances are not more than are required to properly provide for depreciation in all your factory plants taken as a whole.

At the annual meeting of the stockholders, held four years ago, the question of reducing the company's share capital in the manner pre-

scribed by law, was referred to the directors. Since that time the matter has had the earnest attention of your board, and it is their hope that a plan will be submitted for your consideration at an early date, designed to provide for a suitable reduction of the share capital of the company, with a view to the resumption of dividends.

BUSINESS OF THE YEAR.

Gross earnings	$12,524,938 07	
Less expenses	10,727,692 02	
		$1,797,246 05
Interest and discount, and interest on dividends received on securities owned	389,789 16	
Less: Interest on debentures*	333,333 35	
		56,455 81
		1,853,701 86
Deduct amounts written off:		
Sundry losses and allowances for possible losses	79,220 42	
Patents and patent expenses	333,334 68	
Inventories and consignments	89,665 70	
Reserve for extensions to factory plants	250,000 00	
	752,220 80	
Less: Profit on securities sold and debentures cancelled	130,371 31	
		621,849 49
Reduction of the deficit of previous years		$1,231,852 37

*On $8,000 000 for four months and on $6,000,000 for eight months.

In addition to the purchase of $2,000,000 of debentures referred to in previous annual reports, your company has purchased during the year just ended $2,000,000, and the entire $4,000,000 have been destroyed. Since the books were closed $290,000 additional have been acquired, and are now held in the treasury of the company.

An increase is shown in the amount received from interest and dividends from securities owned. It is expected that the income from this source will still further increase from year to year, unless considerable sales of such securities should be made by the company.

The patent situation has not materially changed since the last report to the stockholders. The company has secured many important patents during the year by inventions of its engineers and experts and by purchase.

One of the Van Depoele trolley patents, which had been uniformly sustained by the courts up to last Summer, has been adversely passed upon by the Court of Appeals for the second circuit. This decision was on a motion for preliminary injunction, and is not final. The invention was an important contribution to the electric railway art, and no court has questioned its great merit. There is reason to believe that the technical objections to the claims of the patent, upon which was based the decision of the Appellate Court overruling that of the Circuit Court in favor of the patent, will be found, upon full consideration at final hearing, to be insufficient to defeat the patent.

In view of the fact that nearly all of the railway companies in the country that would be likely to use the overhead trolley system are now electrically equipped, and that the third-rail and underground-conduit methods are being rapidly adopted for the important new enterprises, an adverse decision in this case will have but slight effect upon the business of your company.

Many other cases based upon patented inventions of great value, including a number on the overhead trolley system, are being pressed against infringers, in which early and, it is believed, favorable decisions are expected.

Your careful attention is called to the reports of the vice-presidents having these departments in charge.

Your directors desire to express their appreciation of the valuable service of your admirable engineering and commercial staff, as a result of whose ingenuity and vigilance the company has more than maintained its position of pre-eminence in the varied and constantly increasing applications of electricity.

By order of the Board of Directors.
C. A. COFFIN, president.

The report of first vice-president Eugene Griffin contains the following:

POWER AND MINING DEPARTMENT.

The growth of business in the class of electrical apparatus handled by this department is strikingly shown by the following comparison of orders received for various years past:

Orders for 1893 were 36 per cent in excess of orders for 1892.

Orders for 1894 were 126 per cent in excess of orders for 1893.

Orders for 1895 were 10 per cent in excess of orders for 1894.

Orders for 1896 were 60 per cent in excess of orders for 1895.

Orders for 1897 were 60 per cent in excess of orders for 1896.

Orders for direct-current and induction motors aggregated 19,531 horse-power as against 15,171 horse-power in 1896. Orders for multiphase generators aggregated 49,902 horse-power as against 25,007 horse-power in 1896.

Total transmission lines installed in connection with General Electric apparatus, 326 miles as against 232 miles in 1896.

SUPPLY DEPARTMENT.

The Supply Department has handled 114,229 separate orders during the year, or 43 for each working hour. The "orders received" in 1897 exceeded by 20 per cent the "orders received" in 1896.

The supply stocks carried at our local offices have been decreased about seven per cent during the year, and of the present total, 90 per cent consists of actual supplies, a great improvement over previous years.

The following are some of the principal articles handled by the supply department:

Wattmeters Total number ordered during the year, 36,874; an increase of 42 per cent over 1896.

Measuring instruments—Total number ordered during the year, 3,369; an increase of 38 per cent over 1896.

Transformers—Total number ordered during the year, 11,499; an increase of 36 per cent over 1896.

Arc lamps—Total number ordered during the year, 24,15-; an increase of 75 per cent over 1896.

Sockets and receptacles—Total number ordered during the year, 2,357,629; an increase of 36 per cent over 1896.

Third vice-president E. W. Rice, Jr., says in his report:

The United States Navy is adopting the electric drive in place of steam or hydraulic machinery for ventilating, pumping and hoisting on shipboard, and for lowering and elevating guns and for turning turrets on the warships. This is in addition to the recognized use of electricity for lighting and small power work.

We shall soon be operating our Schenectady works from a distant water-power. We have contracted for a supply of 2,000 horse-power from the Falls of the Hudson River, at Mechanicsville, 19 miles from Schenectady. A novel feature of this transmission is that the generators, each of 1,000 horse-power, have been constructed by us to produce directly a pressure of 12,000 volts, thus saving the cost of the usual intermediate step-up transformers.

Our older transmission plants, such as Portland, Ore., and Fresno, Cal., operated with great success and have largely increased their capacity, demonstrating the advantages of our system and apparatus in the electrical utilization of water-powers.

There has been a great improvement in the efficiency and quality of our numerous small articles of manufacture, such as arc lamps, transformers, meters, switchboards, etc., many features of novelty and value having been developed by our engineers. Our business in this line has shown a gratifying increase.

CONSOLIDATED BALANCE SHEET OF JANUARY 31, 1898.

ASSETS.

Patents and franchises		$8,000,000 00
Factory plants		3,400,002 00
Real estate (other than factory plants)		586,528 61
Stocks and bonds		7,455,872 96
Cash		1,425,874 93
Notes and accounts receivable	$4,537,300 88	
Work in progress	283,831 99	
		4,821,132 87
Inventories:		
Factories	$3,249,183 33	
General and local offices	558,635 23	
Consignments	52,734 79	
		3,860,553 35
Profit and Loss		11,725,561 03
		$41,275,525 75

LIABILITIES.

Capital Stock:		
Common	$30,460,000 00	
Preferred	4,252,000 00	
		$34,712,000 00
Five per cent gold coupon debentures		6,000,000 00
Accrued interest on debentures	50,000 00	
Accounts payable	263 525 75	
		313,525 75
Reserve for extensions to factory plants		250,000 00
		$41,275,525 75

Mr. J. F. Stevens, president of the Keystone Electrical Instrument Company, Philadelphia, is in New York, and attended the opening of the Electrical Exposition Monday night.

THE ELECTRICAL SHOW.

A BRILLIANT SCENE AT MADISON SQUARE GARDEN.

The Second Electrical and Kindred Industries Exhibition Opens in a Blaze of Light.

PRESIDENT MCKINLEY, VICE-PRESIDENT HOBART, HON. CHAUNCEY M. DEPEW, DR. M. I. PUPIN AND OTHER PROMINENT MEN TAKE PART IN THE OPENING EXERCISES—A GREAT THRONG FILLS THE GARDEN—THE WAR NEWS STIRS THE MULTITUDE, AND PATRIOTIC FEELING RESPONDS TO THE NATIONAL AIRS PLAYED BY THE BAND—A SKETCH OF THE CEREMONIES AND WHAT IS TO BE SEEN AT THE SHOW.

From a scene involving careering troops of rough riders, cowboys, Indians and evoluting troops of soldiers to a scene comprising avenues and streets flanked by artistic booths, humming machinery and groups of scientific apparatus, the whole bathed in a burst of light equal to a Summer's noon, is a long hark and a strain upon the imagination to conceive.

And yet in one short week Buffalo Bill's Wild West Show has been replaced in Madison Square Garden, New York city, by the second Electrical and Kindred Industries Exhibition, with all that it implies. A week ago the Wild West Show's cavalcade moved in a procession out of one entrance to the Madison Square Garden, while 50 carts and 200 workmen filed into another entrance. The dirt and tanbark were hauled away, a board floor was erected covering the entire arena space, aisles and avenues were laid off, rail-marked exhibition areas were allotted, booths erected, heavy machinery installed, decorations were tastefully draped, a plant for generating light and power installed, and on Monday evening the highways and byways of an Electric City were thronged with people anxious and eager to see and learn about the latest developments of electrical science.

The great task of changing the scene came easier, however, than

(Continued on page 284.)

THE REGULATION AND PROTECTION OF THE ELECTRIC MOTOR.

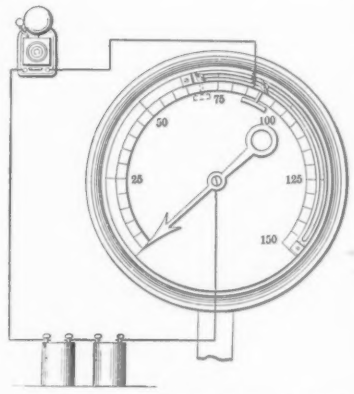
READ BEFORE THE CHICAGO ELECTRICAL ASSOCIATION, APRIL 1, 1898, BY HARRY H. CUTLER.

(Continued from page 252.)

College professors took up the subject, and made careful tests and wrote able articles about standardizing fuses. The conclusion which came was that the chief trouble lay in the fact that the fuses in common use were so short that the terminals and blocks to which they were fastened caused their blowing point to vary by conducting off heat which would otherwise have caused the fuse to blow. This they said could be entirely overcome by using fuses six or eight inches long, and then we would have reliable fuses. Not enough significance appears to have been given to the cooling effect of the ever-varying drafts of air to which the ordinary commercial fuse is exposed; and, therefore, to expect any exposed fuse, no matter how long, to blow at a certain predetermined amount of current appears to the writer to be little short of an absurdity. People naturally became disgusted, and looked around for something better with which to protect their motors. Into this breach the magnetic circuit-breaker bobbed up serenely with its claim for perfection.

The magnetic circuit-breaker recognizes nothing but amperes, and takes no account of whether the motor is hot or cold. Now amperes do not of themselves burn out our motors; it is the heating effect of these amperes, caused entirely by the length of time which they are allowed to flow. Volts on the contrary care nothing about time, so to speak; when the voltage gets high enough the current jumps, and the damage is done instantly, not through ordinary heat, but by the irresistible heat of the electric arc, which volatilizes the wires themselves. It should be noticed, however, that excessive abnormal currents cause instant damage to the commutator of a motor, if not to the armature itself, and should be cut down as quickly as possible. This latter office the ordinary commercial circuit-breaker will generally perform satisfactorily. It becomes a nuisance, however, by opening the circuit and interrupting the service at every little temporary abnormal fluctuation of current, which current would not do the slightest harm, and calls for no protection. What is needed then for properly protecting a motor is, first, a device that will not allow extremely abnormal currents to flow into the motor at all; second, one that will allow slightly abnormal currents to flow through the motor, until the motor begins to approach a dangerous temperature, and third, the device should check an excessive flow of current, so that no undue strain will be put upon the insulation of the motor. No such ideal protection exists to-day, to my knowledge.

The first requirement would be very difficult to meet, and the best that has been done so far is to stop the flow of an excessive flow of current through the motor as quickly as possible. The other two requirements are more easily complied with. To protect a motor from heat it is evident that the heating effect of the current should be utilized in the protective device. This is accomplished in at least two devices now on the market; namely, the enclosed fuse and a peculiar make of circuit-breaker designed by the writer. Both of these devices are shown by samples on the table. The enclosed fuse shown is of the D. & W. make, and the fiber case has been removed in order to show its construction more clearly. The distinguishing feature of this fuse is the enclosed air chamber around the fuse proper, consisting of a gelatine capsule, similar to those used by apothecaries for filling with quinine and other medicines.



AN ELECTRICAL STEAM-GAGE ALARM.

The fuse proper is very short, and is contained entirely within the capsule; copper wire leads are connected to the fuse and lead out to the terminal caps, through closely packed sand or plaster of paris. The capsule provides a definite amount of air within which the explosion takes place, thus greatly increasing the accuracy of blowing at predetermined currents. The force of the explosion is taken up by the layers of sand on each end, and as there is no air and but little metal to feed the arc, it immediately goes out. These fuses are surprisingly accurate, and being absolutely sparkless, would certainly appear to be an ideal protection both for the motor and as against fire. They are ahead of the times, however, and the vast majority of those who operate motors still cling to the old bare fuse, working in the open air, for the protection of their motors.

Circuit-breakers are being introduced very rapidly, however, as a protection for motors, and I have one here which is constructed on a somewhat different principle from anything on the market.

The action of this circuit breaker depends upon the combined magnetic and heating effect of the current. Its mechanical construction is very similar to the usual type, the chief difference being that the magnet or solenoid used to release the trip or catch carries only a portion of the current passing through the breaker. The rest of the current is shunted around the active coil of the circuit-breaker, just as Edward Weston does in his well known station ammeters. The shunt used in this circuit-breaker, however, is composed of material whose resistance increases very rapidly as it becomes heated. The action of this circuit-breaker is very simple. On starting up a motor under load, both motor and circuit-breaker are cold; the resistance therefore of the shunt on the circuit-breaker is at its lowest point, and it carries then the largest part of the current flowing through the breaker; as this current continues to flow the shunt heats up, its resistance increases, and more current passes through the magnet or active coil, which will finally act, should the abnormal current last long enough to become dangerous. It is also evident that an extremely abnormal current or a short-circuit would not wait for the heating effect of the current, but would cause the breaker to open instantly.

In practice these breakers are generally so proportioned as to allow a current of 50 per cent greater to flow for a second than would finally open the circuit if allowed to flow for a minute or two; any current over 60 per cent greater than the continuous current, which would finally open the circuit-breaker, will do so instantly.

A modification of the circuit-breaker is the so-called overload attachment to motor starting boxes provided with the magnetic release. One of these boxes can be seen on the table. They are frequently spoken of as an under overload motor-starter. All the various makes of this type of motor-starter use an electro-magnet for retaining a switch or rheostat lever in closed-circuit position. This retaining magnet is wound so as to connect in series with the shunt field, in series with the armature across the lines or in series with external resistance across the lines. The overload magnet is invariably connected in series with the armature, and carries usually the entire current supplied by the motor. When the current becomes excessive it attracts its armature and demagnetizes the retaining magnet by short-circuiting or opening the circuit of the windings of the retaining magnet. There are also several other ways of demagnetizing the retaining magnet.

A surprising degree of accuracy and reliability can be obtained in this way of protecting a motor from overloads. The system has, however, one chronic fault, which appears to have been entirely overlooked, and that is that no device constructed on the above principle can possibly act quickly enough to protect a motor against extremely abnormal currents, short-circuits or lightning, notwithstanding all circulars and advertisements to the contrary. It takes time to demagnetize a magnet, no matter whether it is short-circuited or open-circuited, and this time is fatal on short-circuits and the motor will not be protected. We must then choose some combination of the various methods just described of protecting a motor. We have here on the table such a combination, which would appear to afford adequate protection for the least money. This device utilizes enclosed non-arcing fuses, the magnetic release, overload magnet and double-pole knife switch. The magnetic release affords ample protection from liability to damage from interrupted current. The overload magnet takes care of all ordinary overloads, and also performs the office of an ammeter, which will indicate the approximate load on the motor at any time. The fuses are selected so as to blow on 100 per cent overloads up to short-circuits. The overload magnet can also be provided with the time-limit device, described above in connection with circuit-breakers. This method of protecting a motor is laid before you for your consideration, and I desire to place myself on record as believing that with such a device on the market for protecting a stationary motor, there are very few places or conditions where the ordinary magnetic circuit breaker will afford equal protection and satisfaction, or be provided at as small a first cost.

An Electrical Steam-Gage Alarm.

As the accompanying cut, which is from a recent patent, suggests, it is a simple matter in these days of electric call bells, says the *American Machinist*, to make a steam-gage instantly announce when the boiler pressure passes either above or below any predetermined points, and, so far as such service is desirable, it is not easy to see why it has not been already more generally adopted. In the arrangement here shown a curved slotted plate is permanently fixed to the face of the gage, and an inwardly projecting T piece is adjustably fastened to it by a bolt and thumb nut. The bell and battery being provided, and both the T piece and the gage pointer being properly insulated from the body of the gage, one wire is connected to the former and the other to the latter. The alarm being used for high pressure, and the T piece being set at the point where the alarm is to occur, when the pointer comes in contact with the T piece the circuit is completed and the bell rings. If the alarm was required for low pressure also, another bell of different tone might be used.

Scientific Apparatus at the Massachusetts Institute of Technology.

At the Massachusetts Institute of Technology, Boston, for the study of cathode rays, besides the ordinary Crookes tubes, there is the apparatus used by Lenard in his classical research, and the tubes of Goldstein showing the existence of several kinds of cathode rays with diverse properties, also several tubes showing the remarkable repulsion phenomena observed by Goldstein. Others illustrate the curious change of colors of salts subjected to the action of cathode rays, discovered by Goldstein, and the capillary light recently studied by Schott. There is also a large collection of electrical and other radiometers illustrating the electrical and heat phenomena studied by Puluj.

The automatic mercury pump, used in exhausting such tubes as are made at home, is a very convenient form, designed by Messrs. Norton & Lawrence, instructors in the Institute, a description of which is soon to be published.

Reference should also be made to new apparatus for illustrating the phenomena of the Hertzian waves; and also the apparatus of Elster and Geitel, for studying the effects of light; and of the X rays, in causing the discharge of electrified bodies.

To the equipment of the Laboratory of Physical Chemistry has been added apparatus for measuring the dielectric constant of substances by means of electric waves. The method, which is due to Professor Drude, of Leipzig, consists essentially in measuring the length of the electrical waves, set up in a system of two parallel wires, by a suitable spark-exciter; first, when the wires are in air, and second, when surrounded by the liquid to be investigated. A vacuum (Geissler) tube placed in the path of the waves indicates by a sudden glow when a movable bridge placed across the wires reaches a so-called node. The apparatus has proved very satisfactory in the preliminary experiments of an investigation now being carried out in the laboratory.

A new quadrant electrometer, of unique construction, has also been received from Germany. The essential difference between this and other forms of this instrument consists in maintaining the vanes in the upper and lower quadrants at a constant difference of potential by means of a dry pile of many hundred films of lead peroxide, the pile itself forming a part of the suspended system. Quartz fiber suspensions are used, whereby a sensitiveness of less than a thousandth of a volt is obtainable. This, combined with the very small capacity of the instrument, renders it of great value for much electrometric work.

For the laboratory of heat measurements there has been purchased a Junker calorimeter, for the determination of the heating value of gas. This is the newest and best device for this work, and makes it possible to determine the efficiency of gas for heating by means of stoves, or its value as a fuel for gas engines.

An extended investigation of the efficiency of non-conducting material, used as a protection for steam pipes and boilers, has been carried on in this laboratory by Mr. C. L. Norton for the last two years, and is nearing completion. This investigation, made at the suggestion of Mr. Edward Atkinson, is carried on by an entirely new method, the heat lost from a pipe being measured electrically. Greater accuracy than was possible by the older process is assured by this method.

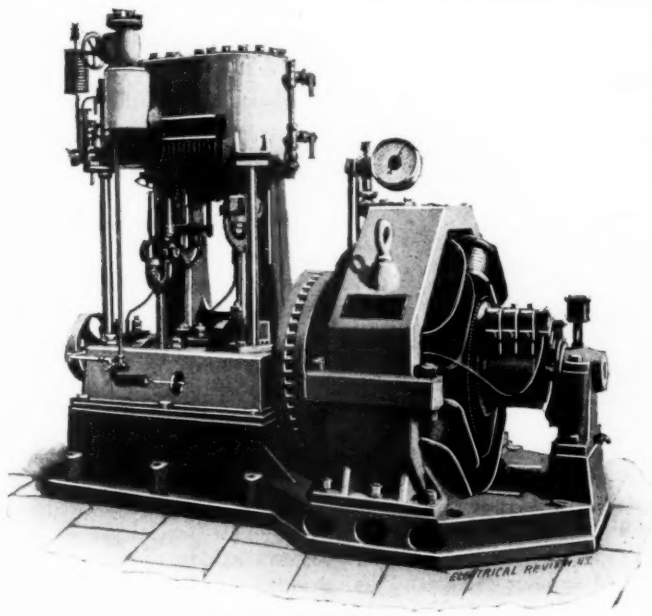
The testing of cold-storage insulation is being carried on in the same manner. The equipment of the laboratory has been further increased by new apparatus for the measurement of the heat combustion of coal, and by a Callendar resistance pyrometer.

Electrical Development in Moscow.

The Berlin, Germany, house of Siemens & Halske, has made a proposal to the Town Council of Moscow, Russia, to construct six lines of electric tramways in the city, and also to take charge of the electric lights, which are now in working order. The concession is to be for a period of 45 years, and the firm is to be paid at certain intervals out of the net profits of the tramways. For the lighting of the city, the corporation is to pay at the same rate as the cost of kerosene lamps. The contract was concluded about a month ago for 6,000,000 rubles ($3,000,000).

The Lighting of Warships.*

With the object of reducing the external magnetic leakage of dynamos, which was liable to affect the ship's compasses, the British Admiralty some years since made trial of a two-pole ironclad type of dynamo. This form of machine was, however, found heavy, and in order to reduce the weight, while at the same time keeping the magnetic leakage at a minimum, the Admiralty have now adopted a multipolar machine. The illustration represents an 80-volt 600-ampere set, running at a speed of 300 revolutions per minute,



An English Electric Lighting Set for Warships.

lately supplied by Messrs. W. H. Allen, Son & Company for H.M.S. "Amphitrite." The armature is of the series-wound drum type, the current being collected by two sets of brushes placed 90 degrees apart. The core is secured to the shaft by means of a cast-iron spider, open at each end to allow free access of air, so as to ventilate the armature thoroughly. The commutator is built up of hard-drawn copper sectors, and is insulated everywhere with mica. The magnets are of high permeability, cast-steel throughout, and consist of a yoke ring with four radiating poles projecting inwards bolted to it. The yoke ring is in two halves, the division being on the horizontal diameter, allowing of the easy removal of the armature without in any way disturbing the magnetic coils. The latter are wound on formers, so that they may be readily removed or replaced.

The engine, which, with its dynamo, is mounted on a combination base plate, is of the compound vertical double-acting type, having cylinders seven and one-half inches and 15 inches diameter by nine inches stroke. The working parts are of steel, having a tensile strength of 30 tons with an elongation of 27 per cent in two inches. The bearings have white metal linings. The engine is constructed for a working steam pressure of 300 pounds per square inch. The steam consumption upon trial at the makers' works was 26 pounds per electrical horse-power per hour, with a steam pressure of 200 pounds per square inch, when exhausting into the atmosphere. The maximum temperature rise of the machine after a six hours' full load trial did not exceed 65 degrees Fahrenheit above the temperature of the surrounding atmosphere. The difference in weight between the four-pole set and an ironclad two-pole of the same output is over two and one-half tons.

Sets of a similar type, but for 400 amperes, have been supplied by this firm to H.M.SS. "Hermes," "Highflyer" and "Hyacinth."

* From the London *Electrical Review*.

Electric Railways for Mainz, Germany.

It is proposed to change the motive power of the local railways in Mainz, Germany, from horse to electric power. Two systems are to be used—on one line the storage and on the other the overhead trolley. At the same time the trolley road is to be extended to one of the suburbs of the city. The Süddeutsche Eisenbahngesellschaft (South German Railroad Company) recently conferred with the municipal and state authorities regarding this project. This company also proposes to establish a trolley road connecting Mainz with Wiesbaden, and another line from Mainz via Kastel, Amöneburg, Biebrich and Schierstein to Eltville. To supply the power for these lines, as well as for local lines, the company intends erecting a large electric power station in Mainz. The estimated cost of effecting the change, including the laying of new steel rails in place of the old ones, and erecting and equipping the power station for supplying power for the local lines and for the two new lines, is placed at $400,000. It is further estimated that the cost of maintaining those cars, which are to be equipped with the storage system will amount to about $250 each per annum.

Electrical Review

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Wireless telegraphy does not seem to come forward as rapidly as its friends thought it would. The "bug" in it seems to be the difficulty of confining a communication to any one set of instruments. Hence, there would be no secrecy. Without privacy of communication the invention has little hope of popularity, even though its effective range could be greatly increased.

A COOL AND PLUCKY ELECTRICAL ENGINEER.

The daily newspapers told us, about the middle of April, that mobs of 1,000 and over made a number of riotous demonstrations before our consulate in Barcelona, Spain. Consul General Bowen, who arrived in Liverpool from Barcelona last Saturday, tells a thrilling story of his successful defense of the consulate almost single-handed. In the course of Mr. Bowen's story, which has been cabled to the newspapers here, he says:

"During the morning of April 20 a mob of 3,000 or 4,000 people suddenly filled the square in front of the consulate, cheering for Spain and uttering other cries. I was breakfasting at the hotel on the opposite side of the square. This mob, having heard of the attack at Malaga, had come determined to get the consulate eagle and shield. I managed to push my way through the people until I got my back to the door and faced the mob. There I awaited the result. I had hardly taken up my position when I noticed a man as big as myself (Mr. Bowen is about six feet high) pushing through the crowd. He came and stood beside me, did not speak, but faced the crowd, which continued to threaten us. Fortunately, the mob had no leader; so for a quarter of an hour we two and the mob faced each other. Then the police and the soldiers arrived, and the mob melted away. I asked the stranger who he was, and he replied:

"'I am Norman Harrington, of Chicago. This is my first day in Barcelona. It seemed to me as if there would be some trouble for the eagle up there and I thought I'd take a bit of it.'"

Isn't that an incident to make the blood of every American tingle with pride? The ELECTRICAL REVIEW is informed that Norman Harrington is an electrical engineer whose home is now in Milwaukee and who has done considerable work in foreign countries for the Edward P. Allis Company, of that city, installing engines for electric railway companies. We are proud of Norman Harrington and feel certain that the whole electrical and engineering fraternity joins us in shaking him by the hand and in congratulating him on his patriotism, his coolness and his pluck. Here's to Harrington!

ELECTRICAL COMMUNICATION IN WAR.

One of the most important elements in the rapid and effective operation of land forces and coast fortifications in time of war is an efficient means of communication. Gen. A. W. Greely, chief of the signal corps of the army, and his able staff have performed almost Herculean labors and made wonderful progress during the last few weeks in providing telegraph and telephone signal systems connecting our harbor and coast fortifications with each other and with Washington. General Greely has now been ordered to New York to complete certain unfinished work in this vicinity, which, when accomplished, will give the best signal system the New York defenses have ever had. General Greely has also provided the troops which are expected to go into active service with a complete outfit of field telephone and telegraph sets, by means of which commanding officers will be able instantly to transmit orders to and receive reports from the front. It is believed that this field apparatus, now for the first time to be put to practical use, will prove an invaluable auxiliary to the army operations. General Greely is to be congratulated on the important work accomplished by his corps under his able direction.

The development in long-distance electric power transmission during 1898 promises some unique and startling results. This is a little prophecy that should be remembered.

As a war measure, long-distance telephone messages are to be taxed. There were no such messages to be taxed during any former war. An entirely new and very extensive industry is thus made, very properly, to bear its share in providing the war revenue.

Mr. Gardiner C. Sims, the well known engine manufacturer, has offered his services to the government. He stated to the Naval Examining Board that he was "willing to serve in the engine-room without pay." This is practical patriotism. It is understood that Mr. Sims will be commissioned a chief engineer.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The stock market has continued under the influence of professional speculators. Opening inactive and low this week, it was stimulated towards the end by the reports that our fleet had shown such excellent marksmanship in Cuba as to make an easy victory elsewhere practically certain. The chief influence for the better, however, was the understanding arrived at by the leading bankers of this city and Secretary Gage, by which the fears of a monetary stringency resulting from war conditions have been practically ended. Large financial interests have said all along that the greatest apprehension should be felt over possible developments in the money market rather than over the war itself, as in the latter case there was little doubt that the American forces would be victorious within a reasonably short time, whereas it was impossible to provide against a sudden withdrawal of money from the ordinary channels and the consequent high money rates. The public so far has not yet begun to reflect the improved feeling, and as a rule is doing but little in the way of speculation or investments.

General Electric was but lightly traded in, only about 1,500 shares of the stock changing hands at 30½ to 32; the Debenture 5's sold up from 96 to 99. The overshadowing interest aroused by the war has prevented Wall Street from studying the salient features of the report of the company for the year ended January 31 last, published in part elsewhere. It is the best report in years, and must prove encouraging to the common stockholders. Progress to the extent of $4,000,000 has been made in correcting the impairment of capital, and a plan to correct it fully is promised, the resumption of dividends to follow. Without the arbitrary reduction made in the annual report, the net earnings show that the full dividend was earned on the preferred stock and slightly over five per cent on the common stock. When simply the net surplus is taken which was applied to the reduction of previous deficits, it is shown that the common stock earned slightly more than three per cent. Generally speaking, the company in the last three years has applied the bulk of its profit and loss surplus to the purchase of its own debentures, while its collections of accounts are represented by increased stocks and bonds on hand. The report has been favorably received in

financial circles, the only item arousing any criticisms being the value attached to patents, which many think to be much over-estimated by the company.

The other electrical stocks were quiet and without marked feature of interest. Western Union sold up from 85¼ to 86½; the collateral trust 5's sold at 105¾. American Telegraph and Cable was quiet at 89 to 90. There was one sale of Edison Electric Illuminating of New York first 5's at 109. Sales of North American were only 700 shares at 5 to 5¼.

The American District Telegraph Company has declared a dividend of 1 per cent, payable May 16. Transfer books close May 6 and reopen May 16.

The annual statement of the Chicago Edison company for the year ended March 31 shows gross income, from electric current and merchandise sales, of $1,661,863; operating, repairs and renewals and general expenses, $985,338; net income from all sources, $676,524; charges against income, interest on bonds and debentures, $226,680; dividends, $398,072; total, 624,752, leaving a balance of $51,772.

New England Telephone reports for the year ended December 31 a gross increase of $316,436; net increase of $55,489, and surplus after dividend of $90,881.

The directors of the Erie Telephone Company yesterday declared a dividend of one per cent, payable May 16, to stock of record May 1. Books close May 1, and reopen May 16. Charles J. Glidden was elected president to fill the vacancy made by the resignation of Mr. Sprague.

On the Boston Exchange Bell Telephone on moderate transactions sold between 246½ to 250, closing at 247. Erie Telephone stock changed hands at 62, closing at 62 @ 62½; New England was quoted at 125 bid, offered at 128; Westinghouse common, 20 @ 21, while the preferred sold at 51¼ @ 52.

In Philadelphia, Electric Storage Battery sold at 19 @ 19⅛ and the preferred at 21⅛, closing at 21 bid, offered at 23½. Pennsylvania Heat, Light and Power was more active than the other electrical securities, selling between 6⅛ and 6¾.

Hudson River Telephone declared the regular quarterly dividend of one per cent, payable May 17. RAY.

Wall Street, April 30.

Mr. S. M. Hamill, general manager of the Brush Electric Company, ran down from Schenectady, N. Y., to New York city for a brief visit last week.

AN ELECTRICIAN CAPTURES THE FIRST SPANIARD.

A HAUGHTY DON STEALS AN AMERICAN REVOLVER AND IS CAUGHT.

Mr. John W. Ebert, who represents the Western Electric Company in Mexico, scored the first victory over the enemy on April 20, as is shown by the following extract taken from a newspaper, *The Two Republics*, published in Mexico:

"Two gentlemen of this city recently paid a visit to the state of Guerrero on business connected with electric installation, Messrs. Ketchum and Ebert. On their return they stopped at Jojutla and put up at the hotel there. It happened that a Spaniard occupied one of two adjoining rooms, and the landlord wishing to oblige the two Americans, by giving them these rooms, shifted the Spaniard to a downstairs room. Messrs. Ketchum and Ebert went down to supper, and, on returning to their rooms, a revolver and belt, the property of Mr. Ebert, was missing. The landlord was at once notified, and on inquiry found that the haughty Spaniard had been seen sneaking downstairs from above, where he had no business. The landlord charged him with the theft, which the Spaniard denied, and on the landlord insisting on searching his trunk and the suspect refusing to permit same, a *gendarme* was called. The Spaniard again made objection and the *jefe politico* was called in to take a hand. He very soon settled the matter by locking the Spaniard up and keeping him in jail until he chooses to open his trunk for examination. There is no doubt that he stole the articles, or he would not have hesitated to open and show up at first.

"So the first Spaniard has been captured by an American and held as prisoner. If every one of our boys does as well as Mr. Ebert the war will soon come to a close."

Later advices to the ELECTRICAL REVIEW direct from the seat of war state that the revolver and belt were found in the Spaniard's trunk, and that he will spend six months in a Mexican prison.

The President's War Office and Its Electrical Equipment.

The office at the White House, formerly occupied by Secretary Porter, has been transformed into a war office for the personal convenience of President McKinley. A full complement of military maps of Cuba and the Gulf States occupies the walls of the room, and the usual furniture has been removed to make way for long-distance telephones, telegraph instruments, and special switchboards connecting the Capitol and the Executive Department, as well as all points from which war news is likely to be received. The war office is so situated that the President can pass directly from his library through the cabinet-room without crossing the corridor.

As the ELECTRICAL REVIEW remarked last week, the State, War and Navy Department buildings are being connected by an underground cable with the Executive Mansion. This work is being done by the Superintendent of Public Buildings and Grounds, and is, in fact, a renewal in part of similar work done in 1883 by a well known wire company for the government. The line was known at that time as the "Department Telegraph Line." The cable now being laid is to be used only for official business between the Executive Mansion and the three departments named.

In addition to these special facilities provided for the prompt receipt and dissemination of official news, the Chesapeake & Potomac Telephone Company, of which Col. Samuel M. Bryan is president, is furnishing a considerable amount of special service to the government in many ways. A great deal of this special service may be considered as emergency work. It is certain that by this time President McKinley is supplied with the best possible system of telephone and telegraph service.

Electric Motive Power On Steam Railroads.

The work on the third-rail extension from New Britain to Bristol, Ct., is being pushed rapidly, and it is now thought that the line will be ready to operate by June 1.

The Chicago, Milwaukee & St. Paul Railroad, which talks of adopting electricity on its Evanston branch (20 miles long), has got its franchise from the Chicago City Council, but the Mayor is likely to veto the ordinance, on the ground that the consideration which the city gets is too small.

It has been decided by the Brooklyn, N. Y., Elevated Railroad Company to equip its road with the third-rail electric system, in connection with Bridge crossing, from the Bridge terminal to Bridge street station of the Myrtle avenue line, which will give about 3,000 feet of electric mileage of the road, and will provide ample accommodations to operate the electric cars over the Bridge.

The Wallkill Valley, N. Y., Electric Light and Power Company has been awarded a contract to furnish light for the village for another year.

PERSONAL.

The great iron master, Herr Krupp, of Essen, Germany, has given $5,000 to the Institute for Physical and Electrical Chemistry at Göttingen University. Professor Nerst is the head of this institute.

Ensign J. B. Cahoon, U. S. N., retired, has been ordered to duty at the Brooklyn, N. Y., Navy Yard by the Navy Department. Mr. Cahoon is well known in electrical circles through his former connections with the Thomson-Houston and other electrical interests.

Mr. Edward P. Thompson, solicitor of patents, and Alfred C. Coursen, attorney, have taken a new suite of offices together in the Fulton Bank Building, New York. Their joint specialty is patent litigation, while Mr. Thompson will continue to attend to soliciting patents. Prof. W. A. Anthony remains associated with the firm.

At a recent meeting of the directors of the Nashville, Tenn., Street Railway Company, Capt. T. M. Steger tendered his resignation as president of the company, and Mr. L. D. Tyson, of Knoxville, vice-president, was elected president. There were no other changes made in the management of the company.

Mr. Thomas R. Mercein, of Milwaukee, secretary of the Northwestern Electrical Association, and Mr. Joseph M. Hill, of the same association, are spending a few days in New York in the interest of the June convention. They attended the opening of the Electrical Exposition at Madison Square Garden Monday night.

President F. A. Gilbert arrived home last week on the "Teutonic" after a few weeks' sojourn in Europe. While abroad Mr. Gilbert visited some 23 electric light stations in London, Paris, Berlin, Brussels and Bristol, and says that European plants do not compare with those in this country. He had a fine trip and is enjoying excellent health.

The annual meeting of the Joseph Dixon Crucible Company was held April 18, and out of 7,345 shares there were 7,042 shares voted for the re-election of the old board, consisting of Edward F. C. Young, John A. Walker, Daniel T. Hoag, Richard Butler, William Murray, Alexander T. McGill and Joseph D. Bedle. President E. F. C. Young, vice-president and treasurer John A. Walker and secretary Geo. E. Long were re-elected by the directors. Judge Joseph D. Bedle was also re-elected as counsel.

TOLD IN THE DYNAMO-ROOM—X.

Ned, Benson and Jim were sitting near one of the radiators one evening about the time when the evening "rush" was over and the load on all the machines was gradually getting lower. Early in the evening a telephone message had called Jim uptown to look after an arc lamp that was reported out. It was quite a tramp up the city, and since his passion for the Metropolis young lady had become more ardent than ever, Jim hated any trouble calls that interfered with his tri-weekly visits to the hotel. Turning to Ned, he said:

"I wish some of you inventors would devise a scheme whereby one could tell at the station the minute a lamp is out. It would save a lot of time and trouble, and should not be so difficult to accomplish."

"Well, I have thought of that very thing a great many times, but must confess that I had to give it up," replied Ned. "About the nearest thing to a satisfactory solution would be to employ a high-reading voltmeter on each circuit, and whenever a lamp cut out the voltmeter would show it."

"That would be all right, if all your lamps remained reasonably constant, as regards voltage," remarked Benson, who as usual had been an interested listener. "But suppose that on a 100-light circuit some eight or ten lamps happened to vary three or four volts about the same time, then it would be hard to decide whether the drop was due to a lamp cutting out or the simultaneous feeding of a number of lamps."

"Yes, that's the way it looks to me, Ned," said Jim, "and besides, I think the boss would hardly care to invest several hundred dollars in a lot of volt indicators. I think we had better write to our friend Bert, and offer him a prize for a simple device."

"Speaking of Bert," laughed Ned, "I wonder how he and his electrician boss are getting along with their new transformer. From the way Bert wrote I take it that that engineer is one of these self-made electricians, who spoiled the job. They always want to get up a machine different from other makes, so as to demonstrate their inventive ability. Have I told you about that electrician who was employed with the Clearwater concern before Bert went there, and who made an exciter that was automatic, had no field rheostat, no movable brush-holders or other brush-shifting device?"

"Not that I remember," replied Jim. "Let's hear about it."

"Yes, tell us the story," said Benson, "and if it's good we can write Bert about it, and possibly he will perfect the device."

"Well, you see this fellow had read in some book that the way to lower the electro-motive force of a machine is to increase the *entre-fer*, which——"

"Hold on there," interrupted Jim, "there you go again with one of your college words. Now what in thunder is ongter fur?"

"Oh, excuse me, Jim," laughingly replied Ned, "that's a French, or rather two French words, meaning literally 'between iron,' and is used to designate the space between the face of the pole-pieces and the surface of the armature core of a motor or dynamo."

"You mean the air space, don't you?" asked Jim.

"No; he means the clearance," ventured Benson.

"There, you see how easily several names can be given to one and the same thing," replied Ned. "That is the reason electrical engineers are striving more and more to secure a uniformity of electrical terms. But to continue. This inventor, I think his name was Craig, reasoned that if an exciter were made that would automatically increase the distance between the pole-pieces and the armature, the problem would be solved. So he went to work and had an exciter made, something like the old Van Depoele arc machines, but instead of casting the field cores integral with the frame, he made them to slide in and out. The pole-pieces came to within about three inches of the iron bases, and to the lower side of each pole-piece was fastened a threaded lug of brass; that is, one lug had a right-hand and the other a left-hand thread. The two were connected by a long screw having a right-hand thread on one end and a left-hand on the other. In the center of the screw was a small pulley, from which a belt ran to a little motor placed on a bracket screwed to the base."

"Ah, I am beginning to catch on to the scheme," interrupted Jim. "All he had to do was to make that little motor turn the screw one way or the other, and the pole-pieces would move in or out. That would work, sure."

"Yes, so it did," continued Ned. "Craig rigged up a relay connected to the station transformer, and as the voltage dropped, the relay would close the small motor circuit in one direction, and the pole-pieces would move towards the armature and vice versa."

"Well, boys," remarked the engineer, who had so far been quietly attending to some minor duties around the engines, "I don't profess to know much about those automatic rigs, but I'll bet you both a good cigar that such a scheme will not work. Do you mean to tell me that if I take one of these engines and rig it up with a reversing lever, I can keep on reversing its motion quick enough to work as perfectly as such an apparatus as that fellow got up ought to work? Not much!"

Jim cast an inquiring look at Ned, who smiled and said:

"Benson is about right, Jim; that is exactly where the trouble was. The thing worked all right, but it was entirely too sluggish. By the time the relay had started the motor in one direction and the voltage was about right, it would keep right on, and before the relay could reverse the motor the voltage would be several volts high and vice-versa; so after tinkering with it for a couple of days they threw the whole outfit into the scrap pile."

Ned's discourse was cut short by the opening of the dynamo-room door, through which appeared a figure familiar to the employés of nearly every lighting plant in the state. It was the genial supply salesman, Joe Reed, who, after a hearty hand-skake to all and a pleasant "good evening," said: "Well, boys, how are you? Just left Evans, after booking his order for a nice lot of supplies, and having a few minutes before train time, thought I'd drop in and have a chat with you. But first let's smoke up, as they say in Chicago," passing around a handful of cigars.

"S'pose these are some of those telephone cigars Jim was telling us about, the last time you were here?" asked Benson, with a sly wink at the lineman.

"Oh, no; this is a new brand, and I think you'll like it."

"By the way, did the boss give you an order for some lamps? We'll soon be out!"

"Yes; got an order for five barrels Liberty, but I wish I could have sold him some of the Empirical brand. I offered him those at a special price—some three cents lower—but he wouldn't hear of it."

"No, I don't suppose he would," laughed Jim. "The boss is through experimenting with lamps; he knows what the Liberty is, and, as usual, only the best goes with him."

"It looks that way," said Reed. "I wish all of my customers were like Evans. But the majority of them want the cheapest that can be produced. To think, for instance, that I would ever have to sell insulating knobs made out of mud. Well, boys, I must be going. Got to catch the 11.30 for Milton Junction." And, with a cheery good-by, Reed left the station, leaving the three friends enjoying the really good Havanas and voting Reed to be a good fellow.

Forthcoming Electrical Expositions and Conventions.

Below will be found a list and dates of the electrical expositions and conventions which will occur during May and June:

Second Electrical and Kindred Industries Exposition, Madison Square Garden, New York city, May 2 to May 31.

Trans-Mississippi and International Exposition, Omaha, Neb., June 1 to November 1.

Philadelphia Electrical Exposition, 1308 Arch street, Philadelphia, June 1 to June 30.

National Electric Light Association Annual Convention, Auditorium Hotel, Chicago, June 7, 8 and 9.

Northwestern Electrical Association, Duluth, June 10 to June 14.

Canadian Electrical Association, Montreal, P. Q., June 28, 29 and 30.

One Thousand Horse-Power at 80–200 Volts.

Problems of special difficulty have been solved by the Westinghouse Electric and Manufacturing Company in the construction of the apparatus recently shipped for the works of the Carborundum Company, of Niagara Falls. One thousand horsepower is supplied at voltages varying from 80 to 200. The work involves peculiar difficulties on account of the wide range of voltage and the very large currents carried. The apparatus, as designed by the Westinghouse staff, is of high efficiency and power factor—necessary virtues in electrical machinery built for this class of service.

Cornell University Summer School.

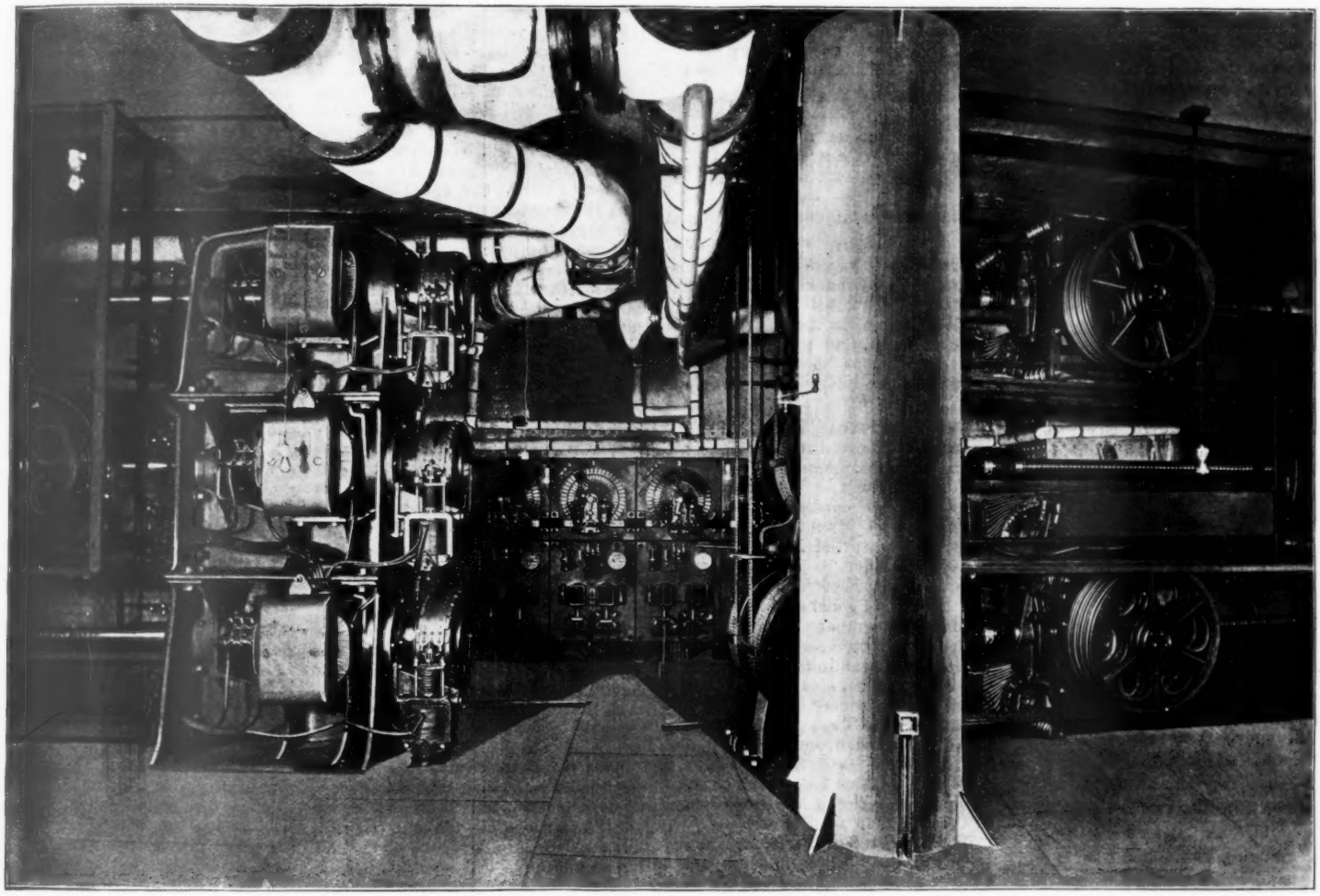
Cornell University, Ithaca, N. Y., has issued a pamphlet describing the courses of instruction in the Summer school for teachers and advanced students. The sessions will be held from July 5 to August 13. Among the courses laid out are one in mechanical drawing and designing and one in experimental engineering.

An Interesting Electric Passenger Elevator Plant.

It is generally known that the Sprague Electric Company, of New York city, are pioneers in the electric elevator business, and that they are responsible for many of the modern devices used in connection with such apparatus. An interesting example of this company's work is afforded in the elevator plant at the Commercial Cable Building, 20 Broad street, New York city, an interior view of part of which is given in the illustration herewith. This plant is arranged in two batteries of multiple-sheave machines.

These batteries consist of three machines each, are of the most modern kind, and run at a speed of 600 feet per minute. The machines are of the horizontal multiple-sheave type, with traveling cross-head and frictionless nut, driven by one and one-quarter-inch pitch screw, revolved by direct-connected motor. The entire operative machinery, both electric and mechanical, is self-contained. The machine will carry, at the speed noted above, a load of 1,500 pounds, and will carry a maximum, guaranteed, of 2,500 pounds, at a speed of 500 feet a minute.

The multiple-sheave machine is specially designed to meet requirements where excessive loads and speed in modern high office buildings are factors. It is recognized by experts as absolutely safe, and, as is true of every other type of the Sprague electric passenger elevator, no accident of an at all serious nature has ever befallen it, principally for the reason that it has mechanical limits of travel. This machine is also known as a gravity machine. On its descent it takes no current. The motor attached to the end of the screw, on being reversed, not only becomes a dynamo, supplying current back to the line, but acts as a dynamic brake as well. It is a machine that is always under absolute control, and, from its inherent construction, it is regarded as well nigh impossible for any serious accident to happen to it. An additional safeguard is provided, however, apart from the construction of the machine, in the Sprague wedge-shape safety device, and the army of elevator patrons of New York and many other large cities, where Sprague machines are installed, look upon the word "Sprague" on an elevator car with a great deal of comfort, for they have already learned that the word is a guarantee of speed, comfort and perfect safety.



VIEW OF A PORTION OF THE ELECTRIC ELEVATOR PLANT IN THE COMMERCIAL CABLE BUILDING, NEW YORK CITY.

A Substitute for Platinum in Incandescent Lamps.

According to a German contemporary, says the London *Electrician*, experiments with iron-nickel alloys have shown that different co-efficients of expansion are obtained according to the percentages of the two metals. An alloy containing 45 per cent of nickel has the same co-efficient of expansion as platinum, and it is stated that this has been confirmed by experiments made at the Reichsanstalt. It is proposed to use this alloy to replace platinum in the manufacture of incandescent lamps.

The Electrical Engineer Institute of Correspondence Instruction.

The Electrical Engineer Institute of Correspondence Instruction has issued a handsome and valuable pamphlet entitled, "Can I Become an Electrical Engineer?" Beside giving a full description of the correspondence institution, the pamphlet contains 32 portraits of prominent electricians, from the time of Gilbert to the present day. These portraits have been especially prepared for this work, and are interesting as well as instructive. The pamphlet also contains a list of references, indorsing the correspondence institution.

Important, if True!

[*From the Boston News Bureau.*]

It is rumored that a consolidation of the diversified interests in the electrical field is under contemplation, and the combination will take in the General Electric, Westinghouse and Walker companies, with a combined capital of $100,000,000.

THE ELECTRICAL SHOW.

(Concluded from page 277.)

might be inferred by the layman. The work was in the hands of electrical men who are accustomed to emergency construction, and to whom an annoying delay or a knotty problem is but the incentive to better and quicker efforts.

Long before eight o'clock, the hour set for the official opening exercises to begin, people began streaming to the various entrances to the Garden in order to secure advantageous places. The President of the United States and the Vice-President were to send to the assemblage in the Garden messages from Washington by means of electrical apparatus of wonderful refinement. In these days when patriotic sentiment and feeling run high, the people are eager for any word from the Executive, and the modern method of sending and receiving these messages served to give additional interest to the proceedings.

At 8.30 o'clock Dr. Chauncey M. Depew addressed the audience and read a congratulatory telegram from President McKinley. The message from Vice-President Hobart was received by telephone on a phonograph cylinder, which continued to repeat the message during the evening.

President McKinley at the White House in Washington touched the golden telegraph key which President Cleveland used to open the World's Fair. When the key was touched thousands of lamps burst into light and the dynamos and motors began to whir.

Dr. Depew's remarks were, as usual, appropriate and interesting. At their conclusion he seized a flag and called for three cheers for the country, the flag and Commodore Dewey for his victory at Manila. The audience responded with a will, the band struck up "The Star Spangled Banner," a young woman sang the same air and the show was opened. It was estimated that 12,000 persons were present during the evening.

CEREMONIES AT THE WHITE HOUSE.

WASHINGTON, D. C., May 2, 1898. —At 8.47 to-night President McKinley formally opened the Exposition by sending a signal from the White House to Madison Square Garden, using Greely's historic gold key for that purpose. The telegraphic arrangements were admirably managed by B. F. Montgomery, the President's executive clerk. The President, with Mrs. McKinley, three other ladies, Secretary Gage and a small boy entered the telegraph office in the Executive Mansion, and the operator notified the managers that all was ready. The representative of the REVIEW was the only other present. Mr. McKinley directed that his message be first sent, in order that it might be read immediately after the Exposition opened. It was quickly transmitted by E. W. Smithers, and then the President firmly closed the key. Promptly came the response that Depew was reading the message, and that the assemblage received it with enthusiasm. A lively interest in the undertaking was manifested by the President and all his guests, and the many marvelous electrical achievements were discussed. Secretary Gage declared "The Arabian Nights are not in it."

GEO. C. MAYNARD.

SOME OF THE EXHIBITS.

ALL OF THEM GETTING INTO FINE SHAPE FOR THE MONTH IN MADISON SQUARE GARDEN.

The exhibits at the Exposition at the time this is written, Monday afternoon, are rapidly assuming distinct form and character. The ELECTRICAL REVIEW will make mention of all of them in more detail from week to week, and presents below a few descriptions that were secured from the very busy constructing exhibitors:

The ELECTRICAL REVIEW headquarters are located to the left of the main entrance, immediately adjoining the stairway. Visitors will be welcomed most cordially.

The Faries Manufacturing Company, of Decatur, Mr. A. W. Koenig, eastern manager, in charge, have an exhibit at the Electrical Exhibition, and show a general line of the goods the company manufactures, such as the "Universal" electric lampholders, and aluminum and steel electric lamp shades, also fire and water-tube boiler cleaners. The exhibit is located on the Twenty-seventh street side of the Garden, on the promenade, just above the main floor, adjoining the booth of the long-distance telephone, and within a few feet of that of the ELECTRICAL REVIEW.

The Keystone Electrical Instrument Company, of Philadelphia, exhibit a very complete line of both switchboard and portable instruments. When finished, their exhibit will include a slate switchboard on which will be mounted a full set of the various switchboard types suitable for use in central stations, street railway and power-houses, and in isolated plants, also a line of ground detectors and instruments, designed for series arc-light service. Portable testing instruments will also be shown. In connection with this exhibit, they will have a pair of type "R" instruments mounted on a panel board, showing them in practical service on a working generator circuit. The exhibit will be in charge of Mr. Elmer P. Morris, 15 Cortlandt street, New York, and Mr. J. F. Stevens, president of the company, will attend.

The Monarch Manufacturing Company, Mr. Albert A. Cary, mechanical engineer, in charge, have several engine-stops and speed-limits on exhibition. One pair is mounted upon a table in connection with an engine-throttle valve. The engine-stop is so connected that by pressing any of the several buttons, placed at convenient points, the valve will be closed inside of five seconds. In order to make this demonstration very plain to visitors, Mr. Cary proposes to mount a church organ-pipe on top of the valve, while below the valve will be connected with piping to a Sturtevant blower, operated by an electric motor. When the fan is running and the engine-stop valve is open a note will be sounded from the organ-pipe, but the moment the valve is closed this sound will cease. The speed-limit will be operated direct from a second electric motor, the speed of which will be controlled by a rheostat. A tachometer will also be connected with the speed-limit, so that the exact speed of the apparatus can be read off by any of the visitors.

When running at a certain predetermined speed the speed-limit will have no effect upon the engine throttle valve, but the moment this limit of speed is exceeded (which is accomplished by moving the lever on the rheostat) the organ-pipe will be silenced in precisely the same way it would be were any of the several buttons pushed. This is a very interesting exhibit for steam engine users, and the working of the apparatus can be so easily shown that they can see and appreciate in a moment just what can be accomplished.

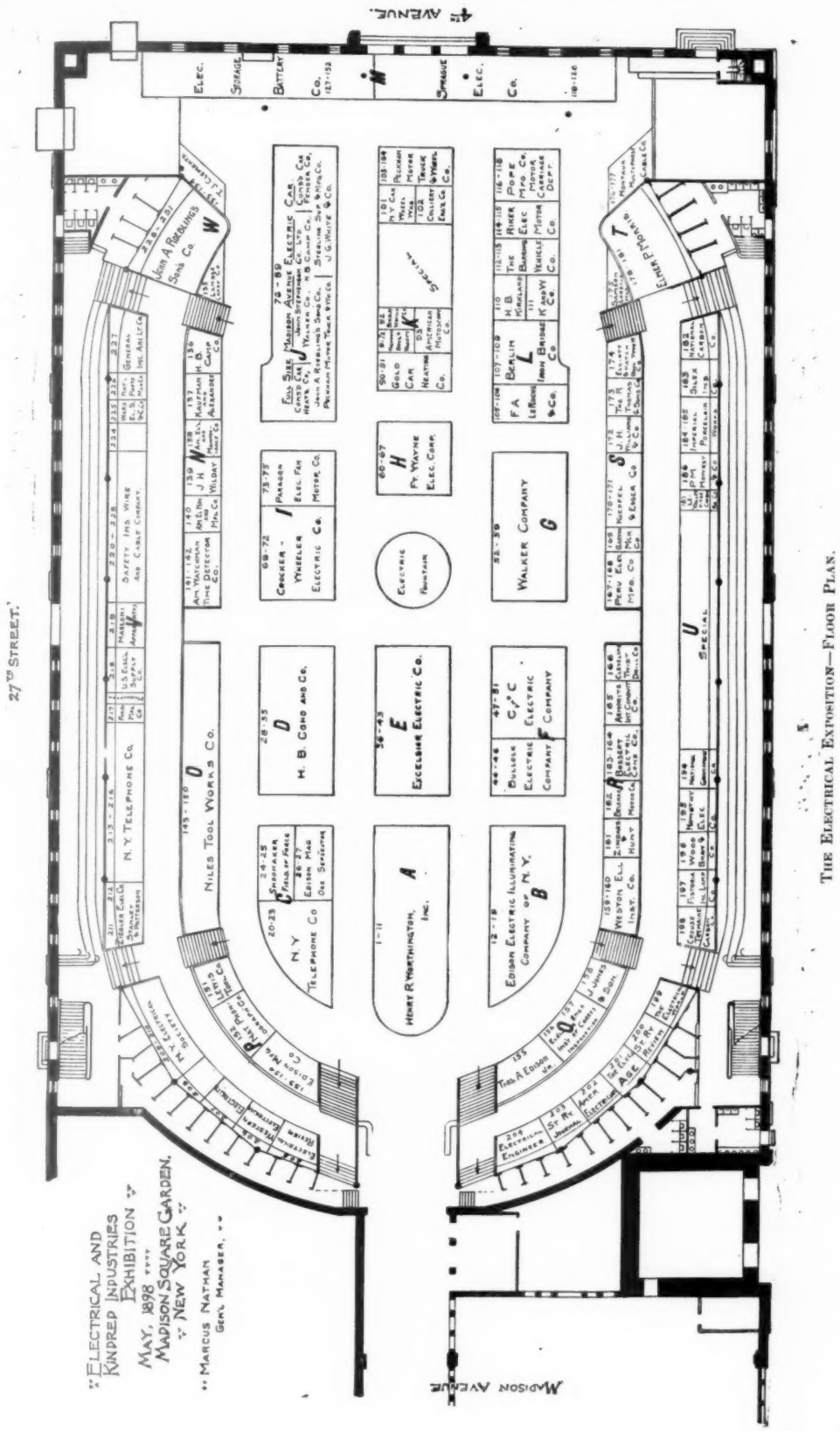
The Montauk Multiphase Cable Company make an exhibit of their new automatic thermostatic interior electric cable. The booth is located at the northeastern section of the Garden, at the junction of the outer aisle, parallel with Twenty-seventh street. As is well known, the Montauk Multiphase Cable Company have recently placed upon the market a new and unique line of electrical goods; in other words, thermostatic electric cables, to be used for all electrical interior work, such as electric bells, electric gas lighting, electric fire and burglar alarm, telephone and telegraph work, and even for electric lighting. In this system power is given to every wire installed, and for whatever purpose used, to discover dangerous heat or flame in existence in the vicinity of these cables, and to notify the existence of the same at any and all points desired, both locally and at central station.

They will exhibit both local and central stations, the latter in connection with the telephone, district service boxes, thermostatic devices, auxiliary fire-alarm boxes and all other electrical transmitting devices, similar to the exhibit in their New York office, at 100 Broadway.

The Nonpareil Cork Manufacturing Company, New York and Bridgeport, manufacturers of insulating material, exhibit a very extensive line of goods. Their "Nonpareil" cork steam pipe and boiler covering is used throughout the Electrical Exhibition. A comparative test for efficiency is being made in their exhibit. Among their products shown are electrical insulation for wires and rails and sectional insulating coverings for steam and water pipes. Artistic and durable floor and wainscot tiling and friction clutch blocks are shown.

The Ashcroft Manufacturing Company, the Consolidated Safety Valve Company and the Hayden & Derby Manufacturing Company exhibit a full line of goods. The well known Ashcroft pressure and vacuum gauges, compound-pressure and vacuum gauges, combination water-pressure gauges, etc., and Edson recording gauges, Kayser automatic safety water gauges, etc., are shown. The boilers supplying the steam for the electrical exhibition will be fitted with Ashcroft steam gauges. These goods are arranged in a very attractive manner in section and in all sizes. The Consolidated Safety Valve Company exhibits the Richardson–Ashcroft solid nickel-seated pop safety valve, the Consolidated brass-seated pop safety valve, and probably a dozen of other products of the company. Injectors, noiseless water heaters, patent suction strainers, etc., are displayed by the Hayden–Derby Manufacturing Company. The boilers of the exposition are fitted with the safety valves of the Consolidated company.

The New York Telephone Company makes an exhibit illustrative of the operation of the telephone system of New York city. There are shown specimens of the latest styles of telephone apparatus and silence booths for the equipment of public and private telephone stations. Pretty nearly everybody is more or less directly interested in the telephone service nowadays, though few know just how it works. The New York Telephone Company's exhibit gives visitors to the show a very fair idea of just how the service does work, as part of the exhibit is a switchboard in actual operation, which serves stations at various points in the exposition building. Trunk lines run from the exposition switchboard to one of the main exchanges, so that the stations in the exposition may not only be connected directly to each other, but also to any station in the city or in any part of the country reached by the telephone systems of the New York, the New York & New Jersey and the American Telephone and Telegraph companies. In short, this part of the exhibit is a working specimen of the private branch exchange system which has been so largely adopted by big business houses of all classes since its introduction by the New York Telephone Company a year or two ago. Arrangements are also making for a separate telephone feature which will be the transmission of music from various New York theatres and out of town points every evening during the month of the exposition. The Exposition company, the American Telephone and Telegraph Company and the New York Telephone Company are working jointly in the production of this attraction, which is sure to be popular with the general public.



American Electrical Apparatus in Europe.

A London paper states that Messrs. L. Lowe & Company, of Berlin, Germany, manufacturers of electric supplies, have ordered from the United States an Allis engine of 900 horsepower, to furnish light and power at their works. The Société des Railways économiques de Liége, Seraing et Extensions and the Compagnie Générale des Railways à Voie étroite have sent to the United States for a complete electrical equipment of the Westinghouse company's make. A large business has been secured by builders of heavy machinery in the United States, for delivery in Great Britain, and it now seems probable that they may find a profitable and an extensive market on the Continent of Europe. The manufacturers of Europe are, however, reported to have good business, and competition from this side of the ocean has not produced any sensible effect in the direction of transfer of trade to this country.

American Institute of Electrical Engineers.

The 124th meeting of the institute was held at 12 West Thirty-first street, on Wednesday evening, April 27. Mr. H. Ward Leonard occupied the chair. About 60 members and guests were present. A paper on "An Economy Test of Central Stations" was presented by Prof. W. E. Goldsborough, of Lafayette, Ind., also a paper on "A Novel Form of Thermo-Electric Battery," by C. J. Reed, of Philadelphia, which was accompanied by experiments. The discussion was participated in by Messrs. Cox, E. P. Thompson, Mailloux, Reed, Wintringham, Steinmetz and W. M. Mordey, of London. At a meeting of the executive committee in the afternoon the following associate members were elected :

Wyatt H. Allen, care H. F. Allen, 202 California street, San Francisco, Cal.; Wm. H. Fitzhugh, superintendent Bay City Electric Plant, Bay City, Mich.; John Breckenridge Fleming, mill superintendent and construction engineer Austin Mining Company, Austin, Nev.; Geo. J. Henry, Jr., engineer for New York branch of the Pelton Waterwheel Company, 143 Liberty street, New York city; N. S. Hopkins, assistant engineer General Electric Company, box 825, Schenectady, N. Y.; Robert Lindsay, general superintendent the Cleveland Electric Illuminating Company, 717 Cuyahoga Building, Cleveland, Ohio; Frederick A. Muschenheim, electrical engineer Western Electric Company, 57 Bethune street, residence, 41 West Thirty-first street, New York city; Newton L. Schloss, consulting engineer, 39 Cortlandt street, residence, Stuart House, New York city; Clarence M. Tolman, electrical engineer, with Edward G. Stoiber, Silverton, Colo.; Ernest Stiles Vinten, draughtsman Walker Company, New Haven, Ct., residence, 89 Pearl street, New Haven, Ct.

Handy Accessories in a Central Station.*

A few handy tools or appliances in convenient and recognized places often save a lot of time and trouble. The ability to put things straight quickly when they have gone crooked is great, but the gift of "looking ahead" for causes which may develop into serious faults and cause disaster is much greater. Frequent testing of machinery and mains, examinations of engines and boilers, are all done with this primary object in view. The caulking of a boiler stay or seam, the tightening of a "big end," the adjustment of a piston or valve, the overhauling of a dynamo, the inspection of switch gear and connections, are each as necessary as the dropping of the oil in the aforesaid bearing.

It is sometimes convenient to be able to make substantial temporary connections at the switchboard promptly, and these connections can be utilized for a variety of purposes; for instance, an engine may get on the dead center; a little current turned into the generator would materially assist in getting over the difficulty. It may be advisable to take current from the switchboard for many purposes, and unless some means is provided it becomes a tedious and hazardous job to connect cable to the terminals or connections. Nothing can be more convenient than to attach to each end of a short length of flexible cable a dummy switch connection cut from a sheet of copper. This switch-blade should have a projection to which an insulated handle could be fixed, and a second projection placed at right angles to handle, to which the flexible cable is securely soldered.

The switch-blade should be the same thickness as the real one, otherwise the jaws of the switch would be spread and the good contact of the switch destroyed. It is not difficult to see that a few of these devices will readily find a use. Some should have switch-blades at each end, while others might have only one end so provided, the other being adapted to connect to the binding screw of a measuring instrument or similar device.

Our old friend, the water rheostat, is almost too well known to need mention. It is nearly as handy as a screwdriver or a pair of pliers, and will serve almost any purpose. For testing purposes it is invaluable. It is most useful used as a regulator when charging accumulators or testing arc lamps, shunting circuit-breakers, operating motors for temporary purposes, or supplying a load for dynamo and motor testing, temporary loads for synchronizing, and many similar uses.

If, for example, it were desirable to rotate one of the machines as a motor, if the main switches consisted of two single-pole switches, as they should, it would be the simplest matter to bridge one of the switch-jaws with the rheostat by means of a pair of flexible connections, as above described. The current could be varied at pleasure by manipulating the rheostat. Indeed, without this device or its equivalent, the operation would be impossible.

An oil barrel, after cleansing, forms a cheap and convenient vessel in which to place the plates and liquid. A metal plate fixed to the bottom of the barrel and a similar plate suspended in the barrel form the simplest arrangement. From each of these plates must be taken a cable, that from the fixed plate may pass through the bottom of the barrel, a suitable water-tight joint being made to prevent leakage of the liquid. The suspended plate should be hung by the conductor, so that in case of a fracture the circuit would be automatically broken and all danger of a short-circuit removed. As an additional safeguard, two strips of insulating material, about one inch in thickness, should be placed permanently on the top side of the fixed plate. This would prevent the plates touching should the suspending conductor be slackened out too much by accident. It is well to have this apparatus placed outside, as the boiling and bubbling causes offensive fumes. It is easy to lead the suspending cable over pulleys to a convenient spot, preferably near the switchboard, when a small arc-lamp winch can be utilized for raising and lowering the plate, as required. A little sulphuric acid added to the water lowers its resistance and allows more current to pass. The exact amount of acidulation is best determined experimentally.

A rheostat constructed on these general lines will be found very useful and will facilitate many operations, which, without such a device, would be laborious and unsatisfactory.

* From the London *Electrical Review*.

At the annual meeting of the Wellsville, N. Y., Electric Light Company the following officers were elected: President, W. S. Kuhn; vice-president, W. K. Dunbar; secretary and treasurer, C. W. Scheck; directors, W. S. Kuhn, W. K. Dunbar, C. W. Scheck, James Macken and Chester Bixey.

Illumination of Textile Mills.

Textile manufacturers throughout the country for many years have been carrying on experiments in their endeavor to secure an artificial light which would enable their operatives to work with the same facility as in actual daylight, and to produce material in the dark Winter days not less perfect than that made in the full light of Summer. Gas has long been discarded by the progressive manufacturer as an inadequate and unsatisfactory illuminant, and even the introduction of the Welsbach has had little or no effect in bringing gas back into favor. The necessity of a light which will not falsify colors to the eye and not injuriously effect it, precludes the use of even the most recent types of improved gas-burners.

The series arc lamp of the type commonly used to illuminate the city streets has been, and even is now, in use in many mills. This lamp, with a clear globe, as generally used, has been found too glaring and penetrating, and, while giving a large quantity of light, has proved inconvenient and unsuitable on account of the uneven diffusion of the light, the creation of heavy shadows and the necessity of changing the carbons daily. The inverted arc lamp, with the inverted umbrella-shaped reflector, has also been tried, and, while the results have been fair, the combination of the large reflector and the lamp is cumbersome and objectionable in appearance, while the necessity of keeping walls and ceilings constantly white is expensive.

The advent of the enclosed arc lamp has, for the first time, given the textile manufacturer a means of illumination which overcomes almost all the different objections and is peculiarly adapted for all classes of mill work. In this lamp the two carbons burn in a small glass receptacle held between the sides of the frame and completely surrounded by the outer globe. The outside air is excluded from the arc by the interior glass receptacle, and thus the carbons burn from 100 to 150 hours without renewal. The light is extremely brilliant and is softened and thoroughly diffused by using globes of opalescent glass of varying degrees of translucency.

Arc lamps of this type, known as enclosed arc lamps, were first developed for direct-current and have come largely into use. They have recently been perfected by the General Electric Company for use on alternating-current circuits also and may, therefore, be used either in mills already furnished with their own direct-current or alternating-current dynamos, or taking electricity from systems used to light the city streets.

Enclosed arc lamps have already proved satisfactory illuminants in mill rooms, where spooling, skeining, sorting and other delicate work is carried on, as well as in the stock-rooms dye-houses, etc. The quality and intensity of the light being adjustable for different requirements and classes of work, being susceptible of regulation and variation by the use of different translucent globes, an almost ideal light is obtainable, as nearly like that of day as is possible with artificial light. The light from the arc, instead of being concentrated and glaring, is perfectly diffused, eliminating all heavy shadows and allowing of results which could not be obtained by any other artificial means of illumination.

The advantages which the enclosed arc lamp offers will readily be appreciated by the mill owners and mill operators: the carbons burn for a long time, a small number only is required and the labor of trimming is very small. It is not necessary, therefore, to have a special man occupied solely in trimming arc lamps during the day.

The direct-current enclosed arc lamp burns for about 150 hours, with one trimming, that for alternating current about 100 hours. In certain mills where these lamps have been installed the light is seldom used in Summer, and in Winter only a few hours daily; under these conditions recarboning is necessary only about twice a year, while the cost of carbons is about five cents. Of course, in other mills where artificial light is necessary for longer periods during dark days or into the night, recarboning is necessarily more frequent, but compared with the open arc lamps the cost of attendance is very small, while that for carbons shows a marked economy. With open arc lamps a large amount of carbon dust collects in the globe; thus, when the globe is cleaned or dusted out by the trimmer, the dust usually settles over anything that may be in the vicinity. With the enclosed arc lamp, there is little or no dust, the combustion being almost perfect, and any that there may be is collected in the small receptacle and held, as it were, in a bottle, to be emptied where it can not settle on any material or into machinery.

A Thirty-Mile Electric Railway.

Electrical features of unusual interest are to be associated with the new equipment of the Lewiston, Brunswick & Bath, Me., Railroad. The Westinghouse Electric and Manufacturing Company is to furnish the apparatus. Generators to supply alternating and direct-currents simultaneously are to be located at Brunswick, Me., the initial installation being 1,000 horse-power. Direct-current is to be used at the sections of railroad in and about Brunswick, and the alternating-current is stepped up to 10,000 volts and transmitted to sub-stations at Lewiston, Bath and Lisbon Falls. Here Westinghouse rotaries transform it to supply their respective trolley feeders. The alternating and direct-current machine is a Westinghouse product, and is well adapted to work of this kind.

An Interesting Long-Distance Transmission Experiment.

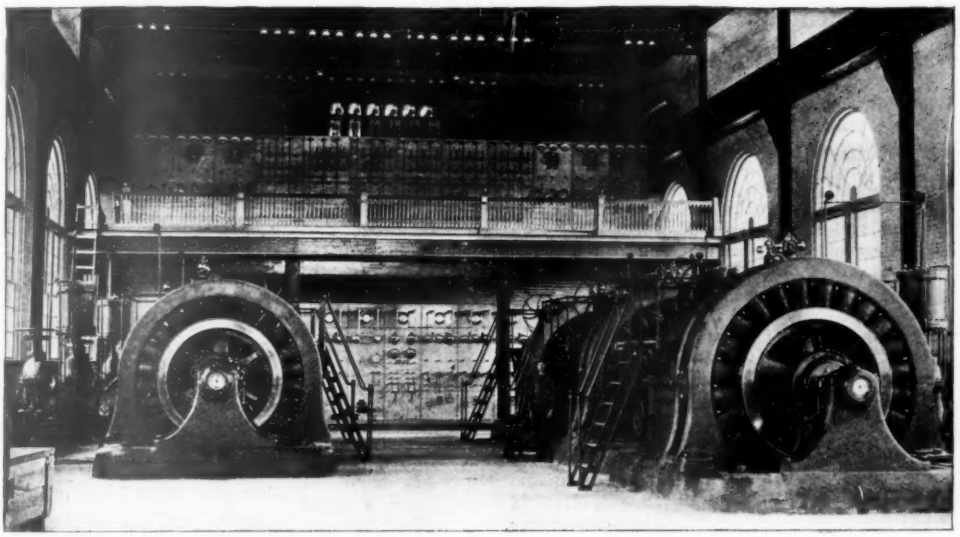
An interesting experiment in high-voltage, long-distance, electric-power transmission, pregnant with influence on all transmission work, was recently made at Ogden, Utah, in order to ascertain the limits within which high-voltage currents might be used commercially. The experiment was made by Mr. F. O. Blackwell, of the General Electric Company, over the lines which connected the great power station of what was, until recently, the Pioneer Electric Company, at Ogden, with the distributing circuits at Salt Lake City, and consisted in connecting the Salt Lake ends of the transmission lines together and dividing the transformers at Ogden, normally used for raising the pressure of the current for transmission into step-up for the outgoing current and step-down for the incoming. The distance from the power station at Ogden to Salt Lake City is about 36½ miles. Making a complete circuit of the outgoing and incoming lines, therefore, with Salt Lake City midway, gave a complete transmission circuit of 73 miles over three No. 1 wires. The amount of power transmitted amounted to 1,000 horse-power, and the voltage at which the transmission was effected reached at times as high as 30,000 volts. The current on the return was delivered to resistance vats at the power-house, consisting of three wooden tanks.

By careful and repeated measurement with wattmeters at both ends, Mr. Blackwell ascertained that this power was transmitted with the loss of only nine per cent, including four per cent loss in the two sets of transformers. The drop in pressure due to inductance was practically nil, the capacity of the line being sufficient to compensate for reactance loss.

Continuing the experiment, part of the Salt Lake City station load was run from Ogden with current at 24,000 volts. This was supplied to about 500 horse-power in synchronous motors, and lights for two days under most severe climatic conditions—rain, fog and snow alternating. In addition, a severe thunder-storm prevailed all through the night, the lightning arresters discharging repeatedly. Notwithstanding the severity of the conditions under which the test was made, the motors operated without failure, and the lights burned without flickering, even during the times of lightning discharges. Not the slightest difficulty of any kind developed while this experiment lasted.

By the recent accomplishment of a scheme of consolidation all the electrical plants in Salt Lake City, as well as the transmission plants supplying current from it to the outside, have been merged into the Union Light and Power Company. The companies thus consolidated were the Pioneer Electric Power Company, the Salt Lake & Ogden Gas and Electric Company, the Big Cottonwood Power Company, the Little Cottonwood Power Company, the Citizens' Electric Light Company and certain smaller interests.

The plant of the Pioneer Electric Power Company is one of the most important installations in the West and the transmission one of the longest. The power-house is located a short distance from the mouth of the Ogden Cañon. The power is derived from the Ogden River, the water being brought to the power-house through a wooden stave pipe and riveted steel pipe line, about 32,000 feet long. The electric plant consists of five General Electric three-phase alternators—24-pole machines running at 300 revolutions, and delivering 750 kilowatts each at 2,300 volts and 60 cycles. The complete plant is designed for 10 units, or a total output of 10,000 horse-power. The exciters are General Electric six-pole, 500-volt kilowatt dynamos, each of ample capacity to excite 10 generators. Each alternator is directly connected to a Knight water-wheel of 1,200 horse-power capacity, and each exciter to one of 135 horse-power capacity.



LATEST VIEW OF THE GENERATING STATION OF THE PIONEER POWER PLANT.

The current is fed into the transmission lines from the step-up transformers at 161,000 volts, and delivered to the step-down transformers at 13,800 volts. They are ordinarily connected in delta, but can also be connected in Y to raise the potential to 25,000 volts whenever it is desired to run at the higher potential in order to increase the capacity of the line or the distance over which the power is to be carried. The switchboard panels on the gallery at the end of the power-house are for the outgoing feeders and are arranged to handle potentials of 25,000 and 30,000 volts. Everything necessary to control the operation of the electric and hydraulic machinery has been carried to the switchboard panels on the same level as the generators.

Both step-up and step-down transformers are of the air-cooled type, and are each of 250 kilowatts capacity. The pressure of the current for local distribution to the smaller transformers at Salt Lake City is 23,000 volts.

Statistics of Street Railways in Massachusetts.

The report of the Massachusetts Railway Commission shows that the average cost of construction of the leading street railway lines in the state in 1888 was $16,921 per mile; equipment cost $7,317 per mile and other permanent property, chiefly lands and buildings, $9,457, making a total cost of $33,695 per mile, against which there was outstanding stocks and bonds of $32,304 per mile. There was a steady increase in construction cost up to 1893, when the average per mile was $26,792; equipment per mile cost in that year $11,739; other property, $15,455, making the total cost per mile of $53,986, an increase in five years in total cost per mile of about $20,000. In 1897 the construction cost had dropped back to $22,755 per mile; equipment to $9,374, and other property to $12,329, making the total cost per mile, $44,458. The largest per centage of advance was from 1888 to 1892, during which time equipment cost rose from about $7,300 to about $15,000 per mile. The largest decline since that day has also been in equipment cost.

The same report, in giving the passenger mileage of steam roads for 10 years, shows a surprising regularity in the volume of passenger business. The average number of passengers per train mile in 1888 was 64; 1889, 67; 1890, 69; 1891, 68; 1892, 67; 1893, 67; 1894, 65; 1895, 67; 1896, 67, and 1897, 64.—*Wall Street Journal.*

Rapid Development of the Polyphase System.

Within the past three years the Westinghouse Electric and Manufacturing Company has installed over 100,000 horse-power of polyphase generators, ranging in size from 10 to 5,000 horse-power each. Judging from the orders at present on hand, the Westinghouse company will build more than 100,000 horse-power of this type of generators alone during the coming year. A single order now on their books calls for 75,000 horse-power.

Polyphase motors have also been made in immense quantities, ranging from one to 500 horse-power, two of the latter being for the Niagara Falls Electric Light and Power Company, where they are utilized to drive the dynamos for lighting the town, power being supplied to the motors by the 5,000-horse-power Westinghouse Niagara generators.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

NEW MARKET, VA.—A long-distance telephone will be put in from Staunton to Hagerstown.

DETROIT, MICH.—Telephone Receiver Company has been incorporated, with a capital stock of $5,000.

SHELBY, TEX.—E. C. Laas is organizing a company to establish telephone system.

PITTSBURGH, PA.—The Pittsburgh & Allegheny Telephone Company has been incorporated by L. H. Matthews, John F. Freeman and John Phelps, to build a telegraph line in Allegheny County for police, fire-alarm and messenger business; capital stock, $1,000.

CLEVELAND, TENN.—A telephone line will be constructed from Sneedville to Morristown.

KENDALL, N.Y.—A new telephone line has just been completed at this place.

STILLWATER, MINN.—The City Council has granted a franchise to Otis Staples, Jas. Mulvey and R. H. Bronson, to construct and maintain a new telephone line here. The franchise extends for a period of 15 years.

DURAND, MICH.—A telephone exchange is to be established here.

VAIDEN, MISS.—The Vaiden Telephone Company, with a capital stock of $1,000, has been incorporated.

LEXINGTON, MISS.—Holmes County Telephone Company, with a capital stock of $500, has been incorporated.

THIBODAUX, LA.—The Cumberland Telephone and Telegraph Company has applied for franchise for telephone system.

AUBURN, TENN.—A telephone line will be extended from this place to Murfreesboro.

LIBERTYVILLE, ILL.—Lake County Telephone Company has been incorporated; capital, $2,500; incorporators, James Turnock, Joseph A. Seyl and T. Degen.

BUNKER HILL, ILL.—The Bunker Hill Telephone Company has organized, with the following board of directors: Adolf Bumann, Charles E. Drew, C. J. Jacoby, James Jencks, John Neil. The officers are: Adolf Bumann, president; C. J. Jacoby, vice-president; Charles E. Drew, secretary and treasurer. The company expects to have the line open for business June 1.

DECATUR, TENN.—The telephone line has been extended from this place to Pinhook and Hester Mills.

BLUFF CITY, TENN.—This place and Piney Flats will be connected by telephone.

LANSING, MICH.—The Citizens' Long-Distance Telephone Company has been organized for the purpose of building a line to Flint from this city. The incorporators are Peter C. Burns, of Chicago; Samuel C. Higgins and Frank Marsh, of Saginaw, and Marsellies L. Joslyn, of Woodstock, Ill.

PUEBLO, COLO.—The Mutual Telephone Company has been incorporated. J. F. Stodahill is interested.

ALMYRA, N. C.—The Almyra Telephone Company has been incorporated by Will A. Wynne, W. W. Wynne, and N. E. Edgerton; capital stock, $5,000.

RED SPRINGS, N. C.—The Red Springs Land and Improvement Company has permission for the construction of a telephone system.

SOMERSET, ME.—The Somerset Telephone Company has been organized for the purpose of operating a telephone exchange for the towns of Madison, Anson and North Anson, with $2,000 capital stock. The officers are: President, Thomas H. Spear, of Anson; treasurer, Jennie L. Spear, of Anson; certificate approved March 15.

New Incorporations.

NEW YORK, N. Y.—The Intercolonial Hydraulic Company, to develop, lease and sell hydraulic and electric properties, has been incorporated; capital stock, $50,000. Directors, Henry F. Whalen, Russell H. Landale, Ernst W. Cooke, of New York; S. F. Smith, York, Pa.; James M. McCarthy, Montreal, Canada; Archibald K. Cook, Quebec, Canada, and Charles E. Hathaway, Providence, R. I.

MONTREAL, CANADA—Northern Electric and Manufacturing Company has been incorporated, with C. F. Sise, president.

SPRINGFIELD, ILL.—Holcomb & Green Electric Company has been incorporated by Eugene Holcomb, H. S. Green and C. F. Adams, to operate an electric light plant, manufacture electric machinery, etc.; capital stock, $5,000.

VICKSBURG, MICH.—Vicksburg Railroad, Power and Manufacturing Company, with a capital stock of $250,000, has been incorporated.

New Electric Railways.

KEOKUK, IOWA—An electric road connecting this place and Quincy is contemplated, and residents along the line are being canvassed for stock subscriptions. Chas. T. Dazey is interested.

HARRISBURG, PA.—A charter has been issued to the Carnegie & Washington Street Railway Company, capitalized at $18,000, to build a line two and one-fourth miles long through the principal streets of Carnegie, to connect with the Pittsburgh, Crafton and Mansfield Street Railway Company. President, A. S. Maxwell, Allegheny; directors, H. E. Barlow, A. M. O'Brien, G. C. Pugh, R. H. McLarn, Pittsburgh.

OSHKOSH, WIS.—The Citizens' Traction Company has let the contracts for its Summer park extension and buildings to the Falk Manufacturing Company, of Milwaukee, on its bid of $10,000.

SYRACUSE, N. Y.—W. K. Niver has made application for a franchise to build an electric railway.

IDAHO SPRINGS, COLO.—It is reported that a proposition is on foot for the building of an electric line up Fall River, via Alice and Twelve Mile, to connect with the Colorado & Northwestern, building out of Boulder. Henry I. Seeman, with offices in the Equitable Building, Denver, is said to have the promotion of the scheme.

CLEVELAND, OHIO—At Columbus, recently, the Chagrin Falls & Eastern Electric Railroad Company was incorporated, with $300,000 capital. The incorporators are F. M. Stearns, John Ensign, C. M. Morgenthaler, Jay E. Lymer, Wm. Prescott, R. L. Palmer and H. J. Coe. The new line is to run from Chagrin Falls to Burton, Geauga County.

JACKSON, MISS.—Biboxi Street Railroad Company has been incorporated; capital stock, $7,500. Incorporators: C. C. Daniels, J. G. Bradford, L. Lopez, George C. Russell and others.

Electric Light and Power.

MASON, TEX.—An electric light plant is to be put in here in a short time.

COLLINGSWOOD, PA.—The electric light system at this place is completed.

MIDDLEPORT, OHIO—It is stated that an electric light plant is to be established here.

FARMINGTON, MO.—The Farmington Electric Light and Ice Company has been incorporated; capital stock, $20,000; incorporators, R. D. O. Johnson, Charles E. Schwarz and C. R. Webb.

LEWISTON, MONT.—G. W. Cook, president Citizens' Electric Light Company, may be addressed concerning construction of electric light plant.

LEE, MASS.—The Lee Electric Company will improve its plant and extend it to South Lee.

CONCORD, MASS.—Work on the proposed electric light plant is expected to commence shortly.

PRATT CITY, ALA.—Town Clerk may be addressed concerning construction of electric light plant.

ARCADIA, FLA.—J. L. Jones, Mayor, may be addressed concerning construction of electric light plant.

FITZGERALD, GA.—City Clerk may be addressed concerning construction of electric light plant.

PHILADELPHIA, PA.—The Union Carbide Company has been incorporated by Joseph P. Devine and others, with a capital stock of $50,000, to succeed the Acetylene Light, Heat and Power Company.

ELECTRIC LIGHT FLASHES.

The Central Light and Power Company, of San Francisco, Cal., has secured the contract to put in an electric plant for the Parrott Building, on Market street, at a cost of $50,000. This does not include the boiler or work in connection therewith.

L. E. Ingalls, who owned a one-third interest in the Economy Light and Power Company, of Joliet, Ill., has sold his stocks to John J. Mitchell, president of the Illinois Trust and Savings Bank, of Chicago. The capital stock of the company is $450,000.

At the annual meeting of the Brush Electric Light Company, of Rochester, N. Y., held last week, the following directors were chosen for the ensuing year: George W. Archer, G. C. Hollister, Frederick Cook, J. N. Beckley, William Runkle, G. A. Hollister, A. H. Harris, H. L. Brewster, J. Lee Judson.

The Edison company, under superintendent Charles F. Perry, will introduce electric lighting at Sea Gate, Coney Island. He will light up the Atlantic Yacht Club house, a number of private houses and the streets of that neighborhood, under contract with the Norton's Point Land Company.

The following directors of the Rochester, N. Y., Gas and Electric Company have been chosen for the ensuing year: J. Lee Judson, William Runkle, Frederick Cook, George W. Archer, Albert H. Harris, Granger A. Hollister, Walter S. Johnson, Harry G. Runkle, R. A. C. Smith, George C. Hollister, Harry L. Brewster, John N. Beckley, George A. Redman.

Wants to Pay and Continue, of Course.

TO THE EDITOR OF ELECTRICAL REVIEW:

I think my subscription to the ELECTRICAL REVIEW expires soon, and wish you would send me bill for the next year. I would not have the REVIEW stopped now under any conditions, and wish it success in the future. Very truly yours,

LEON C. WHITE.

April 21.

LITERARY.

"The Awakening of Noahville" is the title of an interestingly humorous novel by Franklin H. North, illustrated by Walt McDougall, and published by the New York Publishing Company, New York city. Mr. North was at one time on the staff of the ELECTRICAL REVIEW, and has a wide acquaintance among the electrical fraternity. The plot of Mr. North's story is ingeniously intricate and skillfully developed.

TELEPHONE NEWS AND COMMENT.

Telephone (long-distance) and telegraph messages are to be taxed in the new war revenue act proposed by Congress.

The Buffalo Aldermen have declined to grant franchises to two applicants for telephone rights. The Bell company's service and rates seem to be satisfactory in that city.

Chattanooga, Tenn., is considering the question of granting a franchise to a new telephone company. High rates is the only complaint against the East Tennessee company, the present company.

About $10,000 is to be spent on the coast of Maine and Massachusetts connecting the lighthouses with adjacent land stations by telephone. Bids have been opened, and the shortest time offer will probably get the contract.

The druggists of Washington, D. C., are again at war with the Chesapeake Telephone Company. The company wants a guarantee of $10 a month from the public stations in each drug store. The druggists refuse. Hence the present crisis; and 73 telephones have been ordered out.

The Pacific Telephone and Telegraph Company, San Francisco, is rapidly removing its overhead wires and poles. A very complete subway system is being installed, and then the San Francisco telephone plant may be considered a model one—even if it is 3,000 miles away from telephone headquarters.

The American Bell Telephone Company's instrument statement for the month ended April 20 is as follows:

	1898.	1897.	1896.	1895.
Gross output.	29,254	20,426	21,525	18,794
Returned.....	13,139	7,245	6,330	6,253
Net output...	16,125	13,181	15,195	12,541
Since December 20:				
Gross output.	109,921	73,735	76,518	50,157
Returned ...	51,697	28,156	28,462	25,225
Net output...	58,224	45,559	47,056	24,932
T'l outs'd'g.	977,345	819,428	724,592	607,438

All ministers are given telephone service free in the town of Monroe, La., by the Cumberland Telephone and Telegraph Company. This is the result of a rate war between the old company and the new Monroe Telephone Company. Other people than ministers of the gospel are to pay 50 cents a month. This would evidently be a good place for telephonic church services.

The American Telephone and Telegraph Company will make another effort to secure a franchise for their lines in Des Moines, Iowa, from the new Council. The old Council twice refused the request for a franchise. The company's line runs a few miles south of the city, and if brought into Des Moines would make conversation by wire possible between Des Moines and Washington, New York, Chicago or any of the big eastern cities.

INDUSTRIAL NOTES.

The Warren Electric and Specialty Company, of Warren, Ohio, have issued the following: "Warning to the trade. Look out for the label—Irresponsible parties are offering a lamp to the trade labeled 'Warren.' We suggest the name 'cuckoo' as a better name, as the bird of that name shows the same characteristics as the parties behind this lamp. See that you get what you order. Our lamps are all labeled as follows: The Warren Electric and Specialty Company, Warren, Ohio."

The Bullock Electric Manufacturing Company have lately issued a small card, which they enclose in all letters to machine builders and factory owners. On one side of the card is displayed a cut, showing one of their motors operating a 72-inch spray planer. The shaft of the motor is coupled direct to the main driving shaft of the planer. The motor is of small size and is placed on top of the planer, allowing a traveling crane to pass over it. The motor is shunt-wound to give constant speed under varying loads, and has a capacity of 12 horse-power. On the other side of the card is a short description of the arrangement of motors on machine tools and the advantages to be derived from this mode of supplying power. The card is printed in two colors and makes a neat enclosure for letters.

The Chicago Fuse Wire and Manufacturing Company, whose factory was totally destroyed by fire on January 28, are now in better condition than ever before for filling orders for their tested fuse wire and links, which are so well and favorably known by all users of such goods. This company calls attention to the fact that after May 1 all their fuse wire will be packed on the trade-mark spools which they have used for the past five years, and that these spools will in turn be inserted in neat individual tin boxes which will protect the wire from danger of abrasion and also from being affected by changes of temperature. The company will carry a full stock of all sizes of wire, strip, links, telephone and telegraph fuses, and will make shipments from their factory in Chicago or their eastern office at 853 Broadway, New York city, as may be most convenient to the trade. Mr. W. R. Goodman, their manager, says the great consideration shown them by all their friends in the trade during a few weeks of enforced suspension of business after the fire is highly appreciated.

IRON ROOF FOR SALE.

Dimensions of building—87 ft. in width, 225 ft. in length, one story in height; side walls and gables of brick; building designed for a machine shop, but, owing to the failure of the purchaser, the iron roof trusses are now offered for sale at a bargain. The roof is admirably adapted for a machine shop, car barn, paper mill, or for any other general manufacturing purposes.

Apply to
THE BERLIN IRON BRIDGE COMPANY,
EAST BERLIN, CONN.

FOR SALE

A new Electric Light plant in a first-class town of 5,000 inhabitants in Western Penna. Franchises: City street lighting contract, good domestic and commercial patronage. This plant will be sold cheap and upon liberal terms. Full details will be given to a party meaning business.

Apply to
Mr. E. F. AUSTIN,
Room 51 Schmidt Building, Pittsburgh, Pa.

You have Abandoned your Trip to Europe.

You want to get your family away from the sea coast and Spanish flotillas.

You have been abroad. You know all about **Europe** and the **Continent.** Why not see your own **GREAT WEST?**

The climate and attractions of the **PACIFIC COAST** are delightful in summer as in winter. **GO THERE.**

Visit **COLORADO** en route. The mountains of **Switzerland** are no grander. Take in the **GRAND CANON** of the **COLORADO RIVER** in **ARIZONA.** This is to scenery abroad what daylight is to a candle.

Be patriotic and learn something about your country.

SPEND YOUR MONEY AT HOME.

THE ATCHISON, TOPEKA & SANTA FE RAILWAY Agents can give you all the facts regarding this Western trip.

E. F. BURNETT, E. P. Agent,
377 Broadway, N. Y.

THE AKRON INSULATOR AND MARBLE COMPANY,

MANUFACTURERS OF
Electrical Wiring Tubes.

HIGHEST GRADE INSULATORS AND ELECTRICAL CLAY SPECIALTIES OF ALL KINDS.
AKRON, OHIO.

WESTERN OFFICE:
McGILL & POMEROY,
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WRITE FOR PRICES.

FOR SALE...

One 150-h.-p. Single-Cylinder Ball & Wood Engine, 16 x 16, 250 R. P. M. In first-class condition.

Two 60-k.-w. Edison Bi-polar Dynamos, in A No. 1 order.

One 60-inch 3-ply Leather Belt, 96 feet 0 inch long. Run but a short time.

For further particulars, address
J. F. OUTWATER,
360 Pearl Street,
Brooklyn, N. Y.

Bargains in Dynamos, Engines, Etc.

Direct-current dynamos of 350, 700, 725, 800, 810, 900, 1,075, 1,350, 1,610 and 2,500 light capacity.
Alternating-current dynamos of 750, 900, 1,800 and 2,000 light capacity.
Arc dynamos, 20, 24, 30, 40, 50 and 60 lights, both 1,200 and 2,000 candle-power.
Engines, 50, 75, 85, 100, 115, 125, 150, 175 and 200 horse-power.
Boilers, 100, 250, 375 and 500 horse-power.
Heaters, 150 and 2,000 horse-power.
Pumps, all sizes.

Write us for Price-list No. 21.

This apparatus has been removed from our own Central Stations to make room for larger units. We therefore know its history and can guarantee it to be in thoroughly good operative condition.

CHICAGO EDISON COMPANY, 139 Adams St., CHICAGO.

Kindred.... ...Interests

The Reading Electrical Manufacturing Company, of Reading, Pa., is getting out a new catalogue of its excellent goods. This company has a new electric bicycle lamp, which is announced to last 25 hours, with removing zincs.

The Berlin Iron Bridge Company, of East Berlin, Ct., have just completed for the Conway Electric Street Railway Company, at Conway, Mass., a steel bridge, to carry their electric line across the Deerfield River. This bridge is about 300 feet in length.

The Shawmut Fuse Wire Company, 93 Federal street, Boston, have recently issued a circular announcement of special prices on "Shawmut" switches for a surplus stock which they wish to dispose of. It would be well for electrical supply houses and those in need of switches to get this price list.

The Faries Manufacturing Company, Decatur, Ill., have opened an office at 136 Liberty street, New York, under the management of Mr. A. W. Koenig. The Faries company make lamp shades and the "Universal" lamp-holder. This company have also recently prepared a catalogue of their other goods, which they will send on application.

The Westinghouse Electric and Manufacturing Company has recently sold to the Niagara Falls Power Company two 500-horse-power rotary transformers, three 500-kilowatt lowering static transformers, and the complete switchboard for operating the street railway system of North Tonawanda, N. Y., between Buffalo and Niagara Falls.

The Keystone Electrical Instrument Company, Philadelphia, are arranging to double their floor space and increase their manufacturing facilities generally. This will enable the company to handle the very heavy business which is in sight for the coming year. Mr. H. F. Hannis, who has had an extensive experience in banking and financial matters, has recently become associated with the company in the capacity of treasurer.

The Packard Mogul Lamp continues the successful large incandescent lamp. The trade has settled down quite generally to the 300-candle-power size, and this is now being used very extensively for lighting where large units are required. It is an interesting fact that a large number of the first Mogul lamps that were made a great many years ago are still burning and giving good service. The Electric Appliance Company, Chicago, supply the lamp.

The business of Mr. Jos. S. Wood, electrical engineer, and that of Mr. H. M. Shaw, manufacturers' agent, New York city, has been merged into the firm of Wood, Shaw & Company, manufacturers, exporters and dealers in electrical specialties, with general offices at 40 Broad street, New York. The shops are fully equipped with machinery, tools, help, etc., for turning out the highest grade of work in the quickest time possible. They guarantee prompt attention and satisfaction on all orders.

The Electric Appliance Company, Chicago, have increased their line of enclosed Upton arc lamps by the introduction of a new enclosed lamp for alternating work. This lamp is giving very satisfactory results, and gives every promise of being equal in every respect to the direct-current enclosed lamps. The Electric Appliance Company have one of these lamps burning in their store, and it has been commented on favorably by all who have watched its operations.

Geo. W. Patterson, Chicago, reports that on May 1 the companies he represents—the American Circular Loom and the Gordon, Law and Phœnix batteries—will remove from 1114 to 1539 Marquette Building, Chicago, and he invites all old friends and customers to come up and have a bird's-eye view of the city. The conduit business was never so good before, and is increasing, while the merits, and especially low prices, of the Phœnix batteries are beginning to be recognized in a very flattering manner.

The Central Electric Company, Chicago, report that there is an encouraging use of the various electrically heated utensils for cooking and other purposes. The adaptability of this type of apparatus to diversified uses seems to have struck the popular favor. They are carrying all of the various heating and cooking appliances and can make shipments from stock. This company's stock of house goods is one of the most complete stocks of the kind. The increased orders for goods in this department give evidence of the popularity of large stocks and favorable prices.

Western Electric Company, Chicago — Some figures in connection with the new edition of the electric light supply catalogue, recently issued by the Western Electric Company, may be interesting. The edition weighs 20,000 pounds. If the catalogues were piled on top of each other they would make a column 1,000 feet high; and if placed upon the ground, end to end, they would form a line over 6,666 feet long. The edition is complete, containing every well known device that is used in electric light construction, and is so carefully indexed that articles can be found under several headings. Copies will be furnished to the trade upon application, and will enrich every central station library of supply literature that it enters, and it will be wanted numerously.

Eugene Munsell & Company and the Mica Insulator Company, of New York and Chicago, last week completed arrangements with the George Worthington Company, of Cleveland, whereby they became distributors of both "Mica" and "Micanite." Their territory includes the city of Cleveland and some eight or ten of the adjoining counties. A large stock of India and amber mica, in the sheet and segments for railway motors, as well as micanite plate, segments, rings, cloth, paper, etc., will be carried to supply the electrical trade in that section. This is an important step in the right direction, and the trade in Cleveland and vicinity will appreciate the fact that this stock has been placed in the hands of so large a company, who have the facilities for making prompt delivery.

The Sprague Electric Company at its works, New York city, 527 West Thirty-fourth street, is running day and night upon contracts for interior conduit and Lundell power motors for the government. The interior conduit manufactured by the Sprague company is the standard of the United States Government, and it is used not only upon a large number of warships and cruisers, but upon many of the improvised cruisers recently called into service for scouts, torpedo boats and coast defense ships. Mr. J. Pierpont Morgan's beautiful and costly yacht "Corsair" has been taken by the United States Government to act as a torpedo destroyer. This yacht has been commented upon everywhere ever since it was built as a model of construction in every respect. When the contract for equipment was awarded by Mr. Morgan, a complete outfit of the Sprague Electric Company's interior conduit and Lundell direct-connected generating sets was purchased, and it is said that the equipment has never failed to satisfy all demands.

J. C. WHITE & COMPANY,
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ENGINEERS, CONTRACTORS,
29 BROADWAY, NEW YORK, N.Y.
EQUITABLE BLDG., BALTIMORE.

NAGLE & BALL, CONSULTING ENGINEERS.
PLANS, SPECIFICATIONS, REPORTS, DESIGNS.....
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Quick-Break Switches.
If you desire the best, latest and most improved quick-break switch on the market, get the
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They are all made of the best material that can be obtained, and all parts are standard in size. These switches are made in one grade only, highly polished and lacquered.
Send for Catalogue and Prices. They will interest you.
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VERY LIGHT BATTERIES
A SPECIALTY.
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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED APRIL 26, 1898.

602,895 Electric selector; L. W. Crofoot, Aberdeen, S. D.

602,920 602,921 Alternating current induction motor; C. P. Steinmetz, Schenectady, N. Y.—The combination with the primary and secondary members of an induction motor of a tertiary circuit, receiving induced currents through the secondary of the motor and a condenser in the tertiary.

602,922 Electric arc lamp; E. Thomson, Swampscott, Mass.—In an electric arc lamp, the combination with carbon-feeding mechanism, of a thermo-electric expansive device, and a series electro-magnetic controlling apparatus, responsive to variations in the currents passing through the lamp governing the operation of the thermo-electric expansive device.

602,923 Trolley; J. E. Wells, Syracuse, N. Y.—In an electric trolley, a contact frame, comprising sides arching in opposite directions, cross-bars connecting them, one side having a longitudinal groove in its upper face or edge, and the other having a rigid longitudinal flange, and a rolling contact mounted between said sides, combination with a suitable trolley-arm on which said frame is mounted.

602,925 System of electric metering; H. C. Wirt, Schenectady, N. Y.—In the system of electric metering, the combination of circuit mains, a motor mechanism for registering the consumption of energy, and automatic means for varying the damping or retarding effect of the meter.

602,950 Electric massage appliance; F. J. S. Lau, Kansas City, Mo.

602,953 Electric luminous alphabet and board for same; D. M. Moore, Newark, N. J.—The combination with the apparatus box, of a magnet located therein, and the interrupter secured to the cover of the box in a position such that, when the cover is closed, the armature of the interrupter will be placed in the field of the magnet.

602,960 Automatic alarm cell; J. Rumpel, Weston, Mo.—An automatic alarm cell, comprising in combination, a cell proper, a sliding door controlling the opening of the cell, and formed with a fluid chamber, a fluid reservoir connected with the cell, a pipe provided with a rack bar connected with the fluid chamber of the door, a flexible pipe connection between the door pipe and the cell pipe, and a worm-wheel engaging the rack-bar.

602,963 Distribution of electric currents; E. Thomson, Lynn, Mass.—The combination with the main or principal circuit supplied with rapid varying electric currents, of a local or independent circuit, an induction apparatus placed between the mains and the local or independent circuit, reaction coils in the primary circuit of said apparatus, and means for varying the number of coils in which the reaction is set up without short-circuiting them.

603,026 Rheostat; R. W. Ney, New Rochelle, N. Y.

603,042 Hinge connection for electric measuring instrument; A. H. Hoyt, Penacook, N. H.—In a thermal registering maximum meter, electrical connection for the stationary and movable parts of the instrument, consisting of flexible metal strips or ribbons.

603,056 Incandescent electric lamp; M. W. Dewey, Syracuse, N. Y.—The combination in an electric glow lamp, of a receiver of translucent material and a filament without leading-in wires, in the form of a ring or closed coil enclosed therein.

603,060 Electric railway; C. F. Holtmann, Pittsburgh, Pa.

603,061 Device for turning off commutators of dynamos or motors; W. H. Jordon, Brooklyn, N. Y.—The combination with an apparatus for turning off commutators, an adjustable support therefor, adapted to be clamped to the base of dynamos or motors, said support comprising a clamping plate, a plate adjusted thereon, and a standard on said last named plate, upon which the turning-off apparatus is adapted to be secured.

603,063 Rheostat; H. W. Leonard, East Orange, N. J.—The combination of a metal support, covered by a layer of vitreous insulating material, and a conductor held to the support by a layer of cement.

603,069 Electric cables; N. G. Warth, Indianapolis, Ind.—A device of the class described, containing compressed insulating gas confined for service as a dielectric.

603,112 Electric lamp; D. Miscll, New York, N. Y.

603,135 Electrical foot-gear; J. Gallegos; Guatemala, Guatemala—An electrical generator for foot-gear, having an insole, and a generating insole laid on the insulating sole, the generating insole being formed of a fabric composed of woven strands covered with glass beads.

603,198 Electrically propelled vehicle; H. G. Morris, Philadelphia, Pa.

603,229 Storage battery; E. A. Barber, Watertown, N. Y.

603,230 Lining for interior conduits; S. Bergman, New York, N. Y.—In a conduit for electric wires, a tube made from an absorbant vegetable fiber, a fireproofing material and a drying oil in the pores of said fabric.

603,232 Electric clock; S. Fischer, New York, N. Y.—The combination with a minute hand arbor, provided with a minute hand, of a synchronizing electro-magnet, and an armature applied to the said arbor, diametrically in line with the said minute hand and acting as a counterpoise, said electro-magnet being arranged in the circle described by the armature.

The Stanley Electric Manufacturing Company, Pittsfield, Mass., have removed their New York office from Cortlandt street to the handsome new Empire Building, corner of Broadway and Rector street, where the increased office facilities are better adapted for the company's growing business. The new offices are on the tenth floor, at the Broadway corner, and are very light and pleasant.

Removal of the Phœnix Glass Company—The New York offices of the well known Phœnix Glass Company were removed to the new Franklin Building, 15 Murray street, this week. This company will have much larger and more convenient quarters on the second floor of this new building, made necessary by the growth of business. The Phœnix globes and shades for arc and incandescent lamps are justly famous and popular, and are in use the world over. Every one interested should send for a copy of the handsome catalogue, No. 8, of the Phœnix company.

"ELECTRICITY AT THE COLUMBIAN EXPOSITION."

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It is now nearly four and one-half years since the close of the great World's Columbian Exposition, held in Chicago. Every vestige of the famous electrical display at which the people gazed and wondered has disappeared. The people have gone, the buildings have been removed, the drives and walks changed and the Exposition grounds once more transformed into a beautiful park.

Electricity at the Columbian Exposition, however, lives not only in the memories of the people who have seen it, but also in a more substantial form in the shape of a five-hundred-page book compiled by John P. Barrett. This book, "Electricity at the Columbian Exposition," contains eighty-four handsome full-page illustrations, sixteen of which show exterior views of the buildings at night. The brilliant illumination of the buildings by both incandescent and arc lights made it not only possible to photograph them after nightfall, but also gave unique and artistic results. Seventeen of the full-page illustrations are general views giving pictures of the fountains and statuary, and there are also fifty full-page pictures of the various exhibits.

The paper used in this book is finely finished enameled book paper, which allows for the best effect in printing illustrations. The text is generally descriptive of the various exhibits and of the buildings, and also contains several reports of the expenses and the operation of the intramural railway, and several short historical introductions to the descriptions of the various departments of electricity.

The price of this book, bound in cloth, is $1.00. It is supplied by the

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REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.

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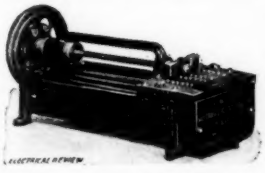

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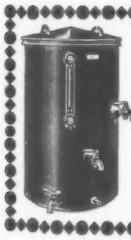

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OUR CANADIAN LETTER.

BERLIN, ONT.—The Galt & Preston electric railway will likely extend its lines to this town.

HAMILTON, ONT.—The Hamilton Radial Railway Company is said to have abandoned the idea of extending the road beyond Burlington.

MONTREAL, QUE.—Mr. J. A. Corriveau states that the Montreal & South Shore Railway will be proceeded with early in the Spring.

VICTORIA, B. C.—The Mountain Tramway and Electric Company will seek for incorporation by private bill at the approaching session of the legislature.

KINGSTON, ONT.—The Kingston & Smith's railway promoters will, it is said, ask for a new charter with power to build an electric railway between this city and Ottawa.

ANNAPOLIS, N. S.—The by-law authorizing the town to operate its own electric light plant and to borrow $12,000 for the purchase of a plant was defeated by the ratepayers.

BOBCAYGEON, ONT.— A meeting was held here last week to discuss the building of an electric railway. A committee was formed to take steps to form a company to build a road connecting Fenelon Falls, Bobcaygeon and Peterboro. W. J. Reed is acting secretary.

ST. CATHERINES, ONT.—A company is said to have been formed and plans matured for building an electric railway between this town and Port Dalhousie, ready for operating April next. H. D. Symmes, manager of the St. Catherines & Thorold Railway, is at the head of the new company.

AMHERSTBURG, ONT.—A company in Detroit has made proposition to build an electric railway from this town to Windsor and Harrow, and wants a bonus of $15,000. M. Joseph De Curse, C. E., has made estimates for grading, bridges, culverts, etc. Several bridges will be required if the road is proceeded with. J. A. C.

Montreal, April 30.

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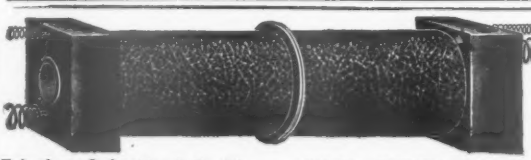

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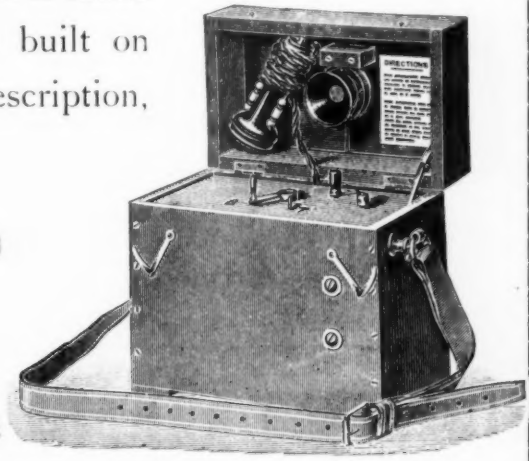

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